Next month Coal Age editors will report meetings of the Rocky Mountain Coal Mining Institute, Illinois Mining Institute, Indiana Coal Mining Institute, and the Mine Inspectors' Institute of America. Such sectional gatherings of coal-mining personnel uncover regional practices and trends of interest to all the industry. . . . **Prescription coal** is proper medicine for ailing markets, and Utah Fuel Co. evinces faith in a healthy future by building a $350,000 central preparation plant to handle output from its Castle Gate and Clear Creek properties. The first of two articles on this installation is found p. 41. . . . **Sales promotion,** well organized, has brought many industries out of the doldrums into favorable trade routes to greater markets. John Scheetz, who successfully launched such a campaign for the manufactured gas industries, presents some amazingly similar comparisons with coal's present position, p. 44. . . . **Stripping and preparation** at the Millstadt plant of Midwest-Radiant Corporation will be featured in July Coal Age. The how and why of mining and processing this smokeless fuel will be followed from pit, through

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TESTED A McGRAW-HILL PUBLICATION READERSHIP

JUNE 1940 Thirty-Five Cents Per Copy

Coal Age

Volume 45 Number 6

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Westinghouse SK Mining Motors

W WESTINGHOUSE ELECTRIC

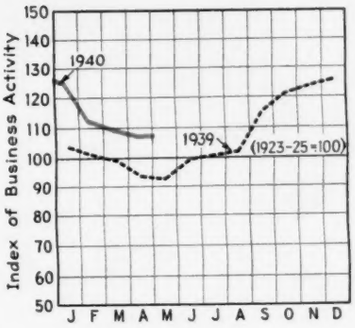
(CONTINUED FROM PAGE 5)

the plant, into trucks, in the next issue. . . . **Cincinnati** last month drew 5,066 people closely connected with the coal industry, to shatter all previous attendance records for the event. Coal Age, in this issue, reports technical sessions and discussions in eight pages, 55-62, embellished with miniature snapshots of some of the prominent coal men seen at the convention. . . . **A review** of new equipment and supplies exhibited at the show also is recorded by pictures and running story in sixteen color pages, 63-78. . . . **Mechanical loading** becomes increasingly important when lower costs are required, but they are gained only when man-power and machines are thoroughly coordinated. At Republic Steel Co.'s western Pennsylvania mine, machines are scheduled to handle 11 in. of drawslate as well as the coal; see p. 37. . . . **Hammond's new breaker** signalizes the fact that great progress has been made in the final preparation of anthracite coal. The story of this installation will be published in an early issue of Coal Age. . . . Report of the anthracite conference at Lehigh University is found p. 90, this issue. . . . **Front cover** this month shows prepared product loaded for market at Monitor Coal & Coke Co., and was released for editorial use by Hulburt Oil & Grease Co., whose advertisement occupied this spot last year.

HOW'S BUSINESS

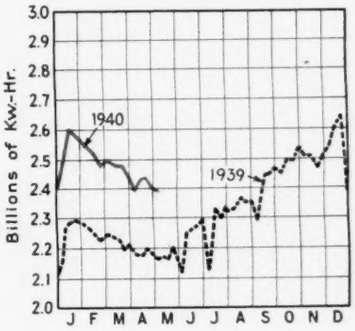
GENERAL BUSINESS ACTIVITIES

A "short-term" upturn in business discerned in late April and early May was definitely here, according to the May 11 issue of *Business Week*. Its index had advanced out of the narrow range of fluctuations around the 105-resistance level to 106.3, and the recession which began in December had become—for the present, at least—ancient history. The decline shot its bolt by mid-March, the tedious process of stabilizing taking six weeks.



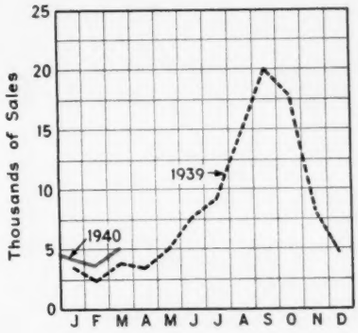
ELECTRICAL POWER OUTPUT

Output of electric energy by the electric-light and power industry during the last four weeks, according to the Edison Electric Institute, was: April 13, 2,418,000,000 kw.-hr.; April 20, 2,422,000,000; April 27, 2,398,000,000; May 4, 2,386,210,000 kw.-hr. The seasonal dip of the latest week given was 0.5 per cent below the preceding week, compared with 0.9 per cent in the corresponding week of 1939, but output was 10.3 per cent ahead of a year ago, 23.1 per cent over 1938, and 9.7 per cent above 1937.



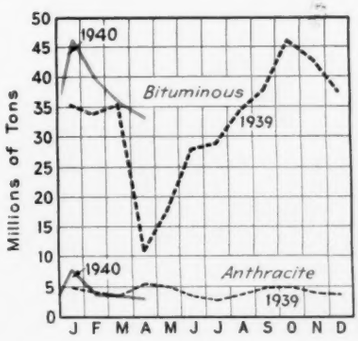
COAL-STOKER SALES

Mechanical stoker sales in the United States in March last totaled 4,210 units (U. S. Bureau of the Census from 104 manufacturers), compared with 3,456 in the preceding month and 3,901 in March, 1939. Sales of small units in March last were: Class 1 (under 61 lb. of coal per hour), 3,673 (bituminous, 3,241; anthracite, 432); Class 2 (61-100 lb. per hour), 245 (bituminous, 227; anthracite, 18); Class 3 (101-300 lb. per hour), 181.



COAL PRODUCTION

Bituminous coal production by United States mines in April last (preliminary) totaled 32,962,000 net tons, according to the Bituminous Coal Division, U. S. Department of the Interior, which compares with 35,210,000 tons in the preceding month and 9,627,000 tons in April, 1939. Anthracite tonnage in April last was 3,747,000 (preliminary), according to the U. S. Bureau of Mines, against 3,773,000 tons in the preceding month and 5,296,000 tons in April, 1939.

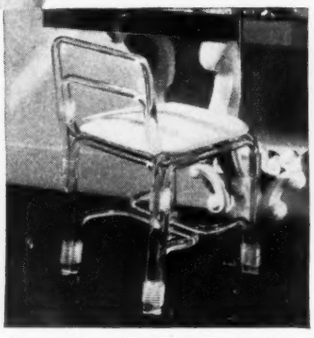


Ever see a girl brush her hair with coal?

THE "Exton" bristles in that beautiful *Patrician* brush are made from a coal base—as is the lovely "Lucite" methyl methacrylate handle. These are but two things Du Pont research has created from coal.

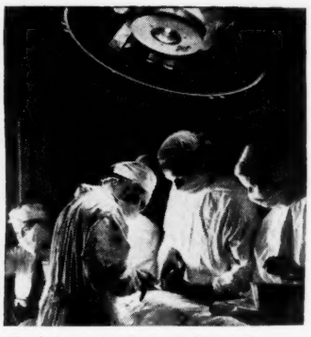
Every year from thousands of tons of coal shipped to Du Pont plants come the materials for making hundreds of different products . . . employing thousands of men and women in industry at *new* jobs created through chemistry. On this page are shown a few of them.

Who would ever have thought that chemical rubber could be made from coal, limestone and salt? Du Pont research found a way and developed neoprene—a man-made, American-produced rubber-like material.



Crystal-clear "Lucite" plastic is a Du Pont coal, air and water product. From "Lucite" has come furniture, airplane windshields, display fixtures, automobile fittings, jewelry—and the vast field is still untouched.

Du Pont makes urea ammonia fertilizers from coal. Uses coal tar compounds for dyes, aromatics, flavorings for foods and tobaccos. And millions of motorists use "Zerone" Anti-Freeze, a Du Pont coal derivative.



Coal has also helped fight disease. Improved anesthetics developed for dentistry, fever-allaying drugs, urea for fighting stubborn wounds, ulcers, gangrene and bone diseases—all stem from coal.

● Du Pont not only produces a great many articles from coal, but also makes many things to produce coal itself. For instance, to help get coal from the earth, Du Pont makes explosives. To prevent mine timbers from rotting, there's a Du Pont wood preservative. To help prepare coal for marketing, the Du Pont Minerals Separation processes are available. And to provide safe, sure ventilation, Du Pont makes VENTUBE FLEXIBLE VENTILATING DUCT.

• • •

These photos show VENTUBE in use in low-coal workings. For more information about VENTUBE, write the "Fabrikoid" Division.

Du Pont also makes a complete line of powder bags from the same sturdy material as "Ventube." Write for prices, sizes and complete information.

**"Ventube" is Du Pont's reg. trade mark for its flexible rubberized ventilating duct.*

E. I. DU PONT DE NEMOURS & CO., INC.
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INDUSTRY ORGANIZES
For National Defense

ALERT to what is happening in Europe, the American people are setting out to strengthen their defenses against aggression from any quarter. Already the government has laid down an initial program to that end.

The surest defense against aggression is the ability to resist it. If we are known to be well prepared we may avert attack. If we cannot avert it we shall be armed against it. But preparedness against war means preparedness to wage war.

And modern war is an industry. Like every other industry, it is a matter of men, materials and machines. Fighting men must be skilled workers, trained to use an arsenal of special tools and equipment that are just as diversified and just as essential to success as those of any other industry.

The plant, supplies and personnel of war must rival in efficiency those of any peacetime industry. For the stakes of success or failure in war are not paid in money profits or losses: they are paid in the lives and property of the people, in the security — perhaps the survival — of a nation.

* * *

Sound national defense calls first for a comprehensive program, carefully planned to back up a clear-cut policy as to what we expect to defend. Next comes the appropriation of funds to realize that program. These first steps are vital: they are up to government.

Then program and appropriations must be translated into performance. Native raw materials must be produced, processed and stored. Our meager supplies of strategic materials of foreign origin must be built up until we have accumulated ample stockpiles against the use and wastage of active war. And most urgent, because it is most complicated, raw materials must be manufactured into the innumerable items required to equip the modern army.

We of McGraw-Hill, living with American industry as we do, are keenly aware of the effort that will be required to produce the materials and equipment now needed to modernize our national armament.

Tanks and anti-tank guns, airplanes and anti-aircraft guns, machine guns and automatic rifles, trucks and tractors, destroyers and supply ships — these are but a few items from the endless inventory of military and naval equipment that we must produce by scores, hundreds and thousands, even to arm an Initial Protective Force, behind which we might rally our national resources for decisive effort.

Obviously the army and navy must count on American industry for an ample and continuous supply of this equipment, and industry must organize to produce it in vast quantities. This means the construction and adaptation of manufacturing, transportation and storage facilities, the organization of competent executive and technical staffs, the training of skilled craftsmen in numbers adequate to maintain exacting production schedules. All this, in itself, is an industrial organization problem of the first magnitude, but upon it is imposed still another and vital specification — *sustained speed.*

For time is the all-essential ingredient of modern war. It cannot be bought with any appropriation, however great; once lost, it cannot be recaptured; we must make effective use of it while we still have it. And at this juncture we have none to waste in fumbling, jockeying or experiment.

* * *

Two courses are open to carry out such a program.

1. We might adopt the totalitarian plan of nationalizing industry, conscripting the wealth and labor of all, and suppressing the normal incentives and management of industry in favor of the authority and control of government officials.

2. Or we can stick to the American way of achieving national unity and efficiency by intelligent cooperation between industry, labor and government.

There are those to whom the first will appeal as being the more direct. But I am convinced that most Americans will insist that the job be done in the American way. And in this preference the President, speaking for government, already has indicated his concurrence.

But effective cooperation in so complex and unfamiliar a task demands the utmost of mutual understanding and confidence from all concerned. Confusion of purpose and conflict of opinion are bound to arise — have, indeed, already arisen. Needs and capacities in many fields must be reconciled, relative priorities for various products must be determined, specific parts of the whole program must be allocated, supervised and coordinated with other parts. Government officials, smarting under the whip of urgency, must render quick decisions on highly technical matters, while industrial executives, masters of their own operating technique, must adapt themselves to arbitrary and unfamiliar requirements.

Under such conditions, many problems will arise that must be worked out between the men of industry and those of government. Some of them will be the more acute because of the restrictions under which industry has had to work during recent years—restrictions that have curbed not only the expansion of plant capacity, but also the development of improved processes and the supply of skilled workers. Now, from this sag in our industrial growth, many departments of industry must undertake an overnight expansion of capacity to meet the exacting time schedules of national defense. So industry must look to government for the cooperation that will enable it to expand its facilities promptly and yet write off in reasonable time its heavy emergency investments.

* * *

If we are to deal wisely with these situations, and many more we cannot now foresee, everyone engaged in any part of the defense effort must be willing and able at all times to get a fair understanding of the problems of the others. To help maintain such an understanding McGraw-Hill is peculiarly fitted.

1. By the organized exchange of views and information among our 24 papers, we can help to coordinate the thinking and practice of the 1,000,000 executives, technicians and operating men who are their readers, in matters that have to do with their part in the defense project.

2. Through constant contact with government agencies and the men of industry, our papers can interpret to industry the needs and policies of government and to government the problems and requirements of industry.

3. For the men of industry, each of our papers will expand its regular service as a clearing house of technical and operating data, with special reference to the needs of plants that are producing defense materials and equipment.

To forward these objectives we have set up within our company a National Defense Editorial Board. It is composed of the chief editors of our publications that serve the functions and industries that are of key importance to the defense effort. Made up of men intimately familiar with the personnel and practice of their industries, this board will stimulate and supervise the activities of McGraw-Hill papers insofar as they can contribute to the defense effort It will outline basic editorial themes, directed to the forwarding of that project, to be adapted by each paper to the special needs of its specific field.

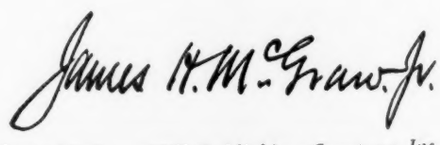
The board will keep close touch with industrial executives and technicians so as to keep abreast of new problems as they arise. It will maintain contact also with government defense agencies and keep our editors posted as to government objectives, plans and problems. Thus it will function as a link between the several governmental defense agencies and the McGraw-Hill editorial organization, and so help each editorial staff to develop a program best suited to the special problems of its industry.

* * *

In thus undertaking our part in an extraordinary industrial effort, we shall not neglect the normal concerns of American industry. So far as may be consistent with the paramount needs of national defense, production and distribution of the goods and services normally consumed by the American people must go on. The effort to mobilize industry for the national defense must be, in large measure, an additional job and an added burden.

That burden is within the capacity of the American people. But it will not be light. And if industry is to carry successfully its heavy share of that burden, it needs the full cooperation of every industrial function.

For more than seventy-five years, through peace and war, McGraw-Hill publications have served to interpret between the various departments of industry and between industry and the American people. Today, as we face these new problems, there is a new and urgent need for interpretation between the industries we serve and the government to which we all bear allegiance. It is fitting that McGraw-Hill should undertake this effort. To it I pledge every resource of our organization.



President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

Coal Age

Established 1911 — McGraw-Hill Publishing Co., Inc.

SYDNEY A. HALE, Editor • JUNE 1940

Pertinent and Impertinent

• Now that minimum bituminous-coal prices are almost established, an interestingly impertinent question suggests itself. Will they stand or will they eventually fall of their own "weighted" weight?

• Underground daylight at working faces is still to be practically developed and applied to high-speed coal production. But some of its advantages may be forecast with reasonable certainty. Accident reductions alone may repay installation and maintenance costs, while possible profits might accrue from increased over-all operating efficiencies on a long-time basis. Better lighting always is worth consideration. Why not now?

• Release of the final sections of the Bituminous Coal Division trial examiners' report on proposed minimum prices was followed by a 13-page errata supplement correcting various typographical and transcribing slips. This, however, will hardly satisfy the people who insist that the whole thing is a mistake.

• One advantage the subscriber has over the editors is that he can afford to give full sway to his likes and dislikes. If one of his pet hates greets him from the front cover of his favorite magazine, he can express his disapproval of such publicity in a blistering letter to the editors. Which is O. K. with the editors, who, like the actors, would rather have their work damned than ignored. For the benefit of those who may not know why certain illustrations are selected for publication, however, it might be well to add that news value—in which timeliness is a major ingredient—is controlling. Men make news, news makes pictures, and news-minded editors, without regard to their own personal preferences or prejudices, publish these pictures.

• Twenty-two mine workers were placed on the 1939 honor roll at the recent annual council meeting of the Joseph A. Holmes Safety Association for "fifty years or more without an accident." One of the group, still active underground, has 63 years' mining without a lost-time accident to his credit, another 61, and a third 56 years. These are golden jubilees which call for congratulations from the entire industry. May their number steadily increase!

• Able Phil Murray looks at men and machines with a questioning eye on worker displacements, but disclaims opposition to the introduction of mechanical devices and new production methods in industry. The problem can be solved, in his opinion, by sharing the larger profits of the new processes with producer labor. Is it out of line to ask whether he is considering the three major groups most vitally concerned? As a reminder, they are: labor, with a living wage; the producer, with a profit, and, by no means last or least, the consumer, with lower-cost coal.

• Another Cincinnati convention is now history. But its impact on the future of the industry should be long felt. When all previous attendance records are smashed by operators bent upon seeing the newest in cost-cutting equipment and supplies and anxious to swap experiences on methods to increase production efficiency and marketability, it is plainly evident that neither the vitality nor the imagination of the industry is at low ebb. Amateur undertakers would do well to search elsewhere for an industrial corpse.

Inviting Fire

Hot-metal sparks from a cutting torch used in repairing a tipple headframe started a fire at the bottom of the 120-ft. shaft. Sparks from a cutting and welding job while building an automatic safety gate at the top of a man-shaft started a fire about 20 feet below the ground level in the wood lining of a shaft. Luckily in both instances —one in Indiana and one in West Virginia—the fires were discovered in the incipient stages and were easily extinguished.

In tipple, preparation plant, headframe, shaft and cage repair jobs requiring the use of a cutting torch, extraordinary precautions should be taken. The bits of hot metal fall

and bounce into remote and inaccessible cracks, crevices and corners and may retain sufficient heat to start a fire even after falling 200 feet or more. Wetting down all surfaces where the hot metal or sparks may reach is a safety measure followed at some mines. When welding or cutting has been done in a wood-frame tipple or at a shaft where fire is a possibility, a watchman should be kept on the job for three or four hours after the work has been completed.

Dust-Removal Hazards

COAL DUST in mines is a continuing hazard but its removal is even more perilous for the short period during which the dust accumulations are being disturbed. Loading out such dust, nevertheless, is a necessary operation, for, when performed while the working force is at a minimum, it reduces the hazard of mining in the hours when many more men would be exposed to the risks of an explosion. Despite its dangers, coal-dust removal usually is intrusted entirely to low-paid uninstructed men who, through ignorance of these dangers, may destroy themselves and the mine.

When coal dust is being dislodged from ribs, cross-timbers, floor and crosscuts, swept into piles and thrown into cars, a cloud of dust is likely to be raised. At the Blackshale mine in Derbyshire, England, a severe explosion in that unusually well rock-dusted operation was held to have been caused by a bad wreck of several cars of dust that had been loaded underground for surface disposal. This wreck in turn broke an electric cable. Thus one accident—a serious derailment—resulted in another—an electric arc—and the second precipitated a third—a dust explosion.

Management, unfortunately, too often considers such trains of sequent related causes so rare that, in planning for safety, they may be overlooked without fear of misadventure. Just such linkages of unlooked-for circumstances, however, not infrequently occur. Perhaps inert material—even disintegrated clay or shale dug up around the mine or on the surface, such as generally is used for tamping—might be taken into the mine and thrown on the dust accumulations to make their handling less hazardous. But the perils of dislodgment of dust from timbers, lagging and ribs would still present a vexatious problem.

Snow Blackout

A LITTLE SUNSHINE on a thin coat of coal dust spread over the top of the snow will work wonders in reducing the depth of a snow pile, according to Prof. H. Landsberg of Pennsylvania State College. Snow reflects 80 per cent of the heat thrown on it by the sun; that is why it is so merciless on the eyes. Covered with coal dust one-250th of an inch thick, almost all the heat from the sun is absorbed and snow on the highway is melted almost five times as fast as when there is no such coating. Moreover, the coal dust will lessen the danger of sliding or skidding. Here is a new use for fine but dirty coal for which there is no ordinary sale.

Seeing the Forest

COAL LOADING essentially is nothing more than the process of moving the coal from the mine floor into the transportation system leading to the outside. This simple fact, however, too frequently is lost sight of in the hurly-burly of installing mechanization equipment and getting it into operation. Keeping a firm grasp of the fundamental purpose of mechanization, however, greatly simplifies the entire problem of applying and using mechanical loading equipment.

If, for example, coal is not available when the machine is ready to load, it may mean that cutting and drilling equipment lacks the necessary capacity, that not enough working places are prepared or all the elements in the working cycle are not coordinated properly. Difficulty in getting the coal up off the floor, with consequent slowing down of loading, may mean that face preparation has been slighted or that the methods used are unsuitable. An undue percentage of idle loading-machine time when coal is available may be the result of too small cars, poor organization of the loading service or bottle-necks in transportation.

The list of factors which influence the efficiency of mechanical mining is by no means limited to the few cited. Those given, however, are illustrative of the fact that many operations which do not directly enter into loading vitally influence the efficiency with which the loading cycle is performed. The actual loading is the thing which should be kept in mind at all times. When this is done, the process of correcting auxiliary activities for maximum efficiency is greatly facilitated.

Healing or Health

TO RETAIN his health has been regarded as every man's personal business, but today good health is being emphasized as an interest of the employer, largely because ailments are a source of absenteeism. When men fail to report for work, output declines, substitutes for the absentees must be found and, until they can be supplied, work is disorganized. The substitute may be poorly trained and he may have accidents because of that inadequate training.

Bad health causes not only absenteeism and the many evil results arising therefrom but also listless, dopey, inefficient employees. It fosters discontent, suspicions and quarrels. It causes accidents. Every employer needs active, intelligent, happy, safe employees. Health will aid amazingly in providing those essentials for productive operation.

Doctors usually do nothing but heal the sick. What is needed is not healing as much as health—bodily and mental vigor—which can be consummated only by training employees in the care of their bodies, provisions for suitable recreation, proper food and water, healthful surroundings at work and away from the job. Health is an asset in any mining town; sickness slows the human mechanism and dulls its edges.

AIR PICKS, STEEL ARCHES

Adopted for Safety and Economy

At West Canadian Collieries, Alberta, Canada

In a heavily pitching mine generating gas and having friable, free-working coal, air picks were introduced to obviate the danger of explosions, and the innovation has been extended with general satisfaction. Arches made from steel railroad rails have displaced timbering, but, as they are not as flexible as desired, in deeper workings, rectangular-section material may be used in place of rails. In places, rails are used as bent bars to support the pitching coal, being wedged between footwall and conglomerate roof.

By R. DAWSON HALL
Engineering Editor, Coal Age

EXTRACTION of coal by reciprocating pneumatic picks to the exclusion of cutting machines and explosives is an outstanding feature in the operation of the Greenhill mine of the West Canadian Collieries, at Blairmore, southern Alberta, situated about a dozen miles east of the British Columbia boundary in the Crowsnest Pass, through which the Canadian Pacific Ry. crosses the Rocky Mountains. The summit of these prominences forms the line separating British Columbia from Alberta.

Another unusual feature is the use of steel arches and, in some places, almost vertical steel ribs ranged along the sides of the main levels, facing a steeply pitching massive and coarse conglomeratic hanging wall, which itself needs no support. These ribs reach from the floor of the level to its lofty peaked top.

The West Canadian Collieries, long signalizing the Franco-British Entente, being financed by capitalists of both nations with headquarters in London, England, and with its president, E. Rasson, at Roubaix, France, has made several developments unusual on this North American Continent. Among them may be noted the aforementioned "pickhammers," those handy means of dislodging coal. These have come into quite general use in the province of Alberta since G. A. Vissac, then general manager of the company, introduced them at its mines.

What largely motivated this innovation were not only the frequent explosions in the region, often unexplained and sometimes occurring even without men being near the area thus ravaged, but the fact that the Alberta government laid such onerous restrictions on the use of electricity underground that it could not be used for mobile units. Today, electricity energizes only non-mobile equipment, such as signals, telephones, the lamps on the roadways and the pumps in the sixth and seventh levels. Where, in the opinion of the Provincial inspectorate, the mine atmosphere is, and is likely to remain, free from explosive qualities, as, for instance, near the intake, the restrictions may be made less severe, but inspectors nowhere are desirous of shifting burdens from others' shoulders onto their own.

Pickhammers first were used in the workings above the third level and only for extracting the upper bench of the coal bed. The bottom bench was shot up after the top coal was removed. Presence of gas made use of powder hazardous, and the lower bench could be lifted effectively with less powder if the top bench had first been extracted.

When the work above the fifth level was started, it was decided that all coal should be mined by pickhammer, and eventually that dictate was extended not only to the lower bench in narrow work but, under Mr. Vissac's successor, J. A. Brusset, the present general manager, to pillars also, as soon as their removal was undertaken.

Recognizing that the use of explosives was extremely hazardous, the miners believed it better to face a falls hazard than the possibility, perhaps the certainty, of the recurrence of an explosion of dust. Even if such an explosion did not result directly from the planned or accidental ignition of an explosive or did not occur indirectly from the sparks caused by conglomerate rocks falling on one another and from the ignition of gas or dust or both consequent thereon, it was well to use pickhammers to reduce the quantity of impalpable dust which would aid in the initiation or extension of an explosion otherwise initiated. In fact, it may be surmised that much of the dust from pickhammers is of such medium coarseness that, as we know, it would be more likely to be suppressive than causative of an explosion until further crushed. It would smother rather than feed the flame.

The general manager felt that at least an experiment should be made to find the relation between output per man and the new method of pillar

drawing. It proved that the change was a source of profit to the miners, and it has now been adopted with full approval of management and men. Fortunately, the fatalities and disablements from falls of rock that some persons had feared did not occur. Accidents from this cause declined rather than rose, and the men, who had carried drills, tamping bars and explosives into the mine and up the ladders, had now only two small pickhammer bits to transport and these they readily could sling over their shoulders.

It should be remembered that, in these Alberta, and indeed in the British Columbia, mines adjoining, the use of the pickhammer finds several favoring circumstances from an economic standpoint. The seam pitches at this mine at about 38 deg., and at other mines pitches are steep, so that the use of heavy undercutting machinery would be difficult and dangerous and the work preliminary to shotfiring somewhat hazardous also and slow, even if the miner himself performed it; still more hazardous, of course, would be the firing of shots. However, at the mines of this field, shotfirers performed this service.

Another favoring circumstance in most of the operating area of the Greenhill mine is the thickness of the coal, which is from 12 to 16 ft. and in places even 30 ft. Because of the height of the working places in the extensive workable areas, a man handling a pickhammer is not hampered in his work as he would be in a thin, flat seam. However, it has been found in the French mines that some men prefer pickhammers for the mining of thin seams, because they find they can lay the tool on the mine floor and let it support iself.

Yet another auspicious characteristic is the softness of the measure and the fact that it is not held in place so tenaciously as in most coal beds. The mineral is a low-volatile coal with no cleats. Like many Western coal beds, No. 1 seam, at Greenhill mine, has shear planes along which, with a pick or pickhammer but more particularly with the latter, it is quite easily broken, if indeed it needs breaking.

Before it was installed, men could not load coal until the shotfirer had brought it down, and when he did bring it down they still could not load it, for the air was too murky from his shots in that or other working places. Now there is no such trouble; the men can work all day long, for the pickhammers are used to mine the entire product.

All the several levels, above and including the fifth, were started at separate openings from the surface. When the fifth level was started it was known that the coal was in such condition that it could not be operated for a considerable distance from the opening. In fact, it did not become operable for a distance of half a mile from the mine portal. It was thought, therefore, that it would be less costly and more expeditious to open No. 1 seam through an under bed, No. 2, which is from 12 to 18 ft. thick. Using No. 2 bed as approach, there would be no conglomerate to hamper the advance. However, as No. 2 seam has a much higher percentage of inherent ash than No. 1 seam, it did not offer the advantage that the coal obtained in driving in it would be marketable.

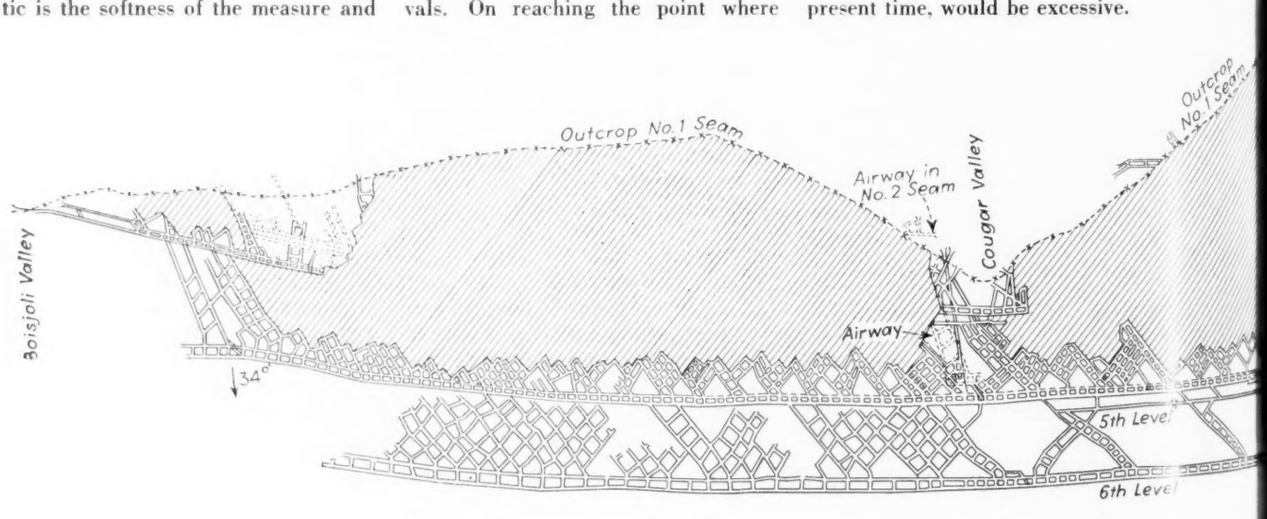
Following the strike of the measure, except for a rise of 0.5 per cent in favor of the load to facilitate haulage and drainage, the two headings of the level were driven without difficulty. Crosscuts in the coal were made between the headings at suitable intervals. On reaching the point where Seam No. 1 became minable, connection was made to it by a short level tunnel in the rock about 90 ft. long, for the two seams are separated vertically by about a 70-ft. interval.

Recently, a heading has been driven in No. 1 seam from the surface to this point, roughly paralleling the earlier entry in No. 2 seam. By the aid of Ventube, it was driven without a return. The hanging wall is of conglomerate about 45 ft. thick; the rib on the rise side leans over the side of the level about 10 deg. from the vertical, with a slight curve at the top where the rib meets the hanging wall.

On the rise side to hold the sloping and curving walls, 60-lb. rails are set at 5-ft. intervals and a stiffening angle bar of rail is used occasionally to join the base of the curve in the rail to the hanging wall in front of it. As the roadway is from 15 to 20 ft. wide, its height varies, and, where the conglomerate is present and reliable, that height is often 25 ft. or more. Otherwise, arches are used and the height is much less.

Such an opening can pass an immense volume of air. At present, the flow, under less than a 1-in. water gage, is 170,000 cu.ft. per minute. This current is provided by one Keith Sirocco and by one Jeffrey centrifugal fan, both of which are located on the surface.

At the far end of the fifth level in the Boisjoli valley—usually corrupted to Boseley valley—No. 1 coal seam again becomes inoperable, though toward the deeper levels it appears to improve greatly. Moreover, an extension into the adjacent hill would strike again into coal of commercial value. Such an extension, however, is not now contemplated, as a haul of four miles or more would result, which, at the present time, would be excessive.



Splitting and thinning of the seams is somewhat characteristic, it is said, of the region. As the phenomenon is local and as thickness is restored again, it does not indicate that the edge of the field is being approached, but, as the splitting and thinning appear to occur usually in valleys and to be surficial, some connect it with erosion, which possibly is a mistaking of cause for effect. The erosion probably follows an ancient fault or disturbance line and the line of disorder does not result from erosion.

The method of developing the coal is by level entries, each consisting of a pair of headings in coal connected by crosscuts in the coal* and separated by 50-ft. coal pillars in the fifth level and by 70-ft. pillars in the sixth; pillar width has been increased, and will be further increased, with greater depth. Adjacent entries are 650 ft. apart between centers as measured on the pitch.

The main or haulage heading of the level, of course, is situated below the counter. Cover over the fifth level is about 850 ft. A slope from that level leads down to a sixth and a seventh level, both of which are working. A second and a fourth level were started in the side of the mountain but were early abandoned. This explains some difficulty in reconciling the numbering of the levels.

Workings from the operating levels are not turned or driven straight up the pitch but at an angle such as to make the inclination of the working place from the horizontal only 28 deg. Thus, degradation and dust in the chutes are reduced. Those inclined headings are known as "angles" and formerly were provided with returns; the pillar between each angle and its counter was 40 ft. thick. "Back angles" were driven from these angles in such a direction that they would rise about 28 deg. to the horizontal.

Originally, the back angles were spaced at 50-ft. centers and, being 10 ft. wide, had pillars between them 40 ft. thick, which in turn were divided by rooms, driven parallel to the "angles" at 28 deg. pitch so as to make pillar blocks 40 ft. square, converting the plan into a close similitude to chicken netting.

Experience, however, has shown that the pillars might be increased advantageously to 100 ft. square and the openings from 10 ft. wide to 12½ ft., and this change in dimensions has been made effective in all the more recent work. This was known as the "angle-and-back-angle method."

Today, angles are started from the head of every crosscut which leads in the coal from the level haulway to its counter. These crosscuts, which travel straight up the pitch, are so spaced that angles driven from them will be 100 ft. apart in the clear. In this region it is customary to term such crosscuts "raises" in the manner of the metal miner. The new system is designated the "true- or straight-angle method."

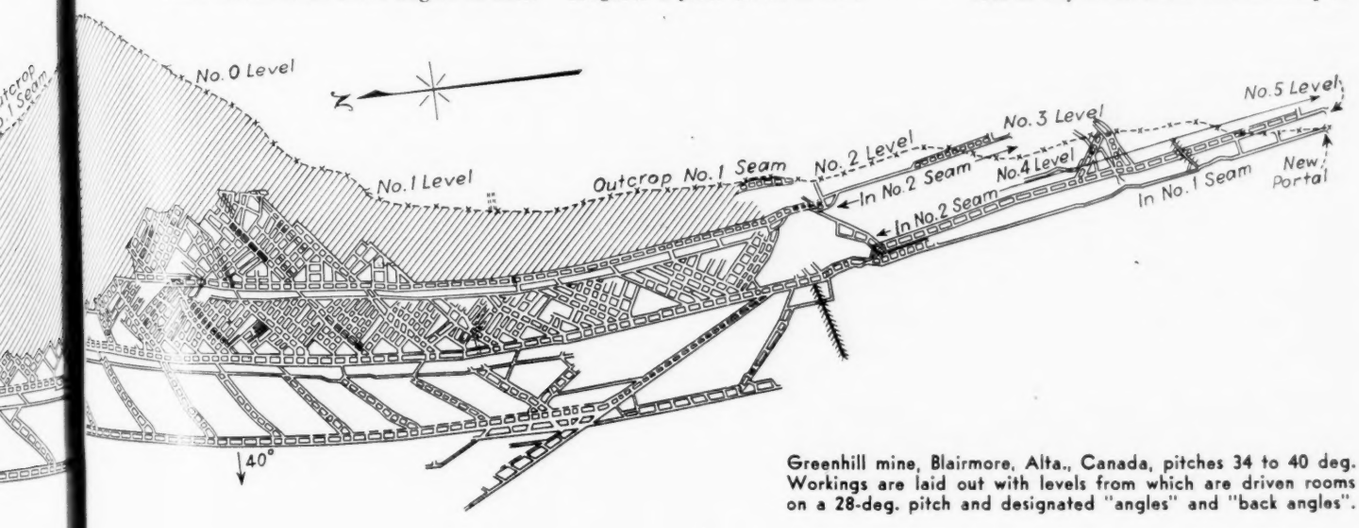
Angles, back angles and crosscuts are driven so as to extract the seam to its full thickness if the immediate roof is strong enough that no layer of coal need be left for its support. Where the roof is of conglomerate, timber posts are set against that material and all the coal is recovered. In that instance, no crossbars and lagging are necessary to assure the safety of the men.

Where, however, the material immediately over the coal is sandy shale, extraction in angles, back angles and crosscuts in coal, as also in pillars, is carried only to a convenient "smooth," or bedding plane, below the hanging wall. In this case, crossbars (collars) of 8-in. diameter and lagging made of 4-in. poles or suitable slabs are needed at the roof to extend the support provided by the posts, which in all cases are of 8-in. diameter. (In the headings of the fifth level, when timber was used, 17-in. round tree-timber was supplied, but this in all working levels now is being replaced by steel. Timber in this dry country lying to the east of the Rocky Mountains is none too good.)

In every angle, back angle or crosscut are both a manway and a chuteway with two lines of timber at 5-ft. centers or closer, one row positioned closely against the coal on the side of the manway and the other situated in the center of the place. On the side against the chute, where no one travels, sufficient protection is provided by the face of the coal.

When the roof is of conglomerate, the pickhammer men attack the pillar first near the bottom of the seam, so that the coal above them will slough off and fall. When, however, the hanging wall has to be protected by a layer of coal, the top of the pillar under the smooth is removed first. To reach this elevation, a plank cut at one end like a bootjack—that is, with a fork—is set with its square end against the base of a prop to the rise of the pillar to be scalped and with its bifurcated end against the side of another prop so that the plank will firmly embrace this prop, without risk of turning, and can be secured at any appropriate level and inclination. Thus, a man with a pickhammer readily can operate his tool at any level. After he has scalped

* Locally the word "crosscut" expresses a cross-measure cut in the rock, not a cut in the coal. In what follows the word "crosscut" will be used to designate a place driven in coal.



Greenhill mine, Blairmore, Alta., Canada, pitches 34 to 40 deg. Workings are laid out with levels from which are driven rooms on a 28-deg. pitch and designated "angles" and "back angles".

the upper part of the pillar, he similarly scalps the coal below it.

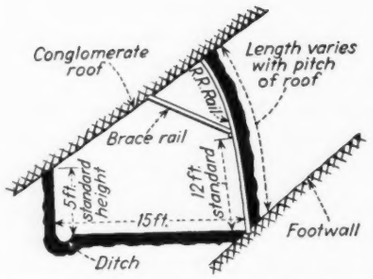
Pickhammers are of two types: Forges et Aciéries de Meudon P–2–A and P–38. The lighter type, weighing 16 lb., was put in service first. On the introduction of the heavier tool, which weighs 20 lb., opposition arose, but experience soon proved that with it larger output and earnings could be obtained, and now everyone is anxious to have one of these larger picks allotted to him. Compressed air at 100-lb. pressure is provided, but, at the point of use, the pressure is about 80 lb. per square inch, though exceptionally it may be less.

To protect the level entry, what is termed a "barrier pillar" is left. The expression is used locally to designate the coal left between the lower edge of the depillaring and the main heading of the level. It is, of course, by no means an entirely virgin pillar but is threaded by the crosscuts between the haulage heading and its counter, the counter itself and also the angles and back angles as far as the barrier pillar extends.

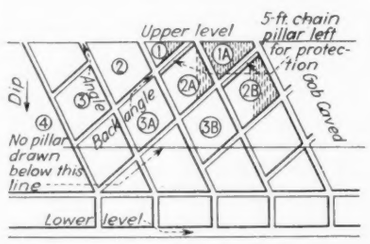
Under the coal, the material is shale, which gives no trouble until pillars have been drawn. It does not expand and blister, nor does it squeeze under the load, but it will break between supports under excessive pressure. In the upper levels with 150 ft. of barrier pillar, much heaving resulted in the level after the pillars in the angles and back angles, rooms and crosscuts had been removed, though much of the lowering in entry height which occurred was due to the collapse of the pillars under weight. Accordingly, with increased depth of cover, the width of the barrier pillar is being increased to 250 ft. Barrier pillars are largely recovered, being drawn as fast as the coal is removed from the pillars in the level below.

How Pillars Are Drawn

Pillar drawing has been completed in all levels above the fifth, thus ending operations in pillars found to be undesirably small. Only a few pillars remain in the fifth level. In the workings from the sixth level also, pillar drawing has commenced. A start has been made not far from the extremity of the operable coal, and that start has taken the form of a Vee, or wedge, with its base on the fifth level and its point directed downward toward the sixth. It will be extended until it is 250 ft. from the main heading of that level; then the wings of the Vee will be advanced on the strike, both north and south, thus converting the extracted area from a wedge-shaped block into a trapezium with its truncated top paralleling the main heading of the sixth level but 250 ft. distant.



Cross-section, No. 5 level, near portal showing steel rail against rib on rise side of roadway.



Pillars are scaled 6 ft. at a time, as shown in illustration, and are attacked in order of numbering. A pillar marked with both a figure and a number, as 2A, is mined at the same time as a pillar marked with the same figure, 2.

When pillar drawing is first started in the workings subsidiary to any level, the pillar is attacked concurrently at (1), (1A), (2A) and (2B) as in the sketch above. As there is no further use for that level, the pillar can be drawn out completely. Depillaring proceeds by cuts straight down the pitch.

About two miles from the portals of the Greenhill mine is Cougar valley, named after the mountain lions that once beset these fastnesses and still sometimes make their appearance and prey upon deer. Into this draft, the seams outcrop, and an opening has been made to No. 2 seam. An entry with two headings connected by crosscuts in the coal at intervals has been driven in this seam and from it 90-ft. rock tunnels have been excavated to the several levels. This airway serves as the main return.

From this Cougar valley also, timber is passed down into Seam No. 1 through chuteways maintained in the mine and protected by pillars. Short, level places in the chutes are provided to reduce the speed attained by the timber and thus prevent its destruction or the displacement of posts, collars or lagging resulting from the timber leaving the guidance of the chutes.

In the levels, steel support, at first, was afforded by 1x2-in. strap-steel arches, at 3-ft. centers, stiffened by $\frac{3}{8}$-in square bars. From each set, some of these bars would pass through the steel of the adjacent arch to the steel of the arch beyond. An equal number of bars, alternating with the others, would pass through the steel of this arch to connect the arches on either side.

Strap-steel arches of this type were used almost exclusively in the airways in No. 2 seam. However, as these arches were constructed of new—not waste—material, they were expensive; they were, however, flexible—a quality greatly to be desired—and would have served well under greater weight, but the cross-section would have had to be increased, which would have further increased the expense.

Hence, old 60-lb. rail was purchased from the Canadian Pacific Ry., bent to shape and used for the formation of semicircular arches with a radius of $7\frac{1}{2}$ to 10 ft., so as to form an opening $9\frac{1}{2}$ ft. high and 15 to 20 ft. wide. The rail arches are set at 5-ft. centers and are kept at the correct distance by struts, or "punch posts." These arches are completely lagged.

Support Not Flexible

Mr. Brusset prefers the more flexible form of support and declares that, where there is considerable pressure, the rail sets, being of hard steel, would prove brittle and break, whereas strap steel would merely deform and could be removed and straightened, as is customary in French mines. It is realized that while success has been attained with such rail weights and distances between sets and that while there has been no deformation despite the absence of stilts and other sliding contacts, it is because the depth of the workings rarely exceeds 850 ft. Where the hanging wall is of conglomerate, arches are made to give place to almost vertical rails placed only on the rise side, as already described in reference to the newly constructed approach to the fifth-level workings.

The mine produces 1,800 tons daily with a force of 315 men, including all men at the works. The seams are in the lower, or Kootenay, formation of the Lower Cretaceous age. Of this mine and the Bellevue colliery, Bellevue, Alta., L. P. Robert is general superintendent, and M. H. Congdon, mining engineer. At the Greenhill mine, H. Blake is superintendent.

MECHANIZED MINING

Includes Handling 11 In. of Drawslate

At Republic Steel Co.'s Crescent No. 2 Mine

Taking down and disposing of 11 in. of drawslate is an integral part of the mechanical-loading cycle at Crescent No. 2 mine, where both caterpillar- and new track-mounted machines are employed. Performance has been improved by a change to angle openings and adoption of a full-retreat mining plan. Automatic couplers on mine cars have increased efficiency and reduced lost-time injuries to nearly zero.

By IVAN A. GIVEN
Associate Editor, Coal Age

USING both track- and caterpillar-mounted loading machines on a three-shifts-per-day schedule, the Republic Steel Corporation is recovering 6½ ft. of coal at Crescent No. 2 mine while handling 11 in. of drawslate. Crescent No. 2, producing metallurgical coal, lies west of the Monongahela River near Belle Vernon, Washington County, Pa. The property was leased from the Pittsburgh Coal Co. in December, 1937, this lease also covering equipment, including caterpillar loaders and 5-ton mine cars with automatic couplers. The coal is cleaned under contract at the Champion No. 6 plant, Pittsburgh Coal Co., Negley, Ohio.

Operations were resumed at Crescent No. 2 July 28, 1938, and the original loading machines have been supplemented by track-mounted units, one accompanied by track-mounted cutting and drilling equipment. Also, several shortwall cutters have been replaced with newer-type machines. Considerable experimentation on a mining system more suitable for heavier cover and loading machines, particularly the track-mounted type, has resulted in a full-retreat plan with diamond-shaped blocks, compared with the original half-advance half-retreat system with 90-deg. rooms and crosscuts.

Crescent No. 2 was opened in 1936 and is reached by a haulway from the Monongahela River through the old Eclipse mine and across a steel bridge. The seam is the Pittsburgh, averaging 6½ ft. Cover ranges from zero to 500 to 550 ft. and over the major acreage will run 50 to 500 ft. The seam is underlaid by fireclay, on which is about 1 in. of dirty coal. This bench is separated from the main seam by a ½- to ¾-in. parting serving as a natural dividing line in mining. About 27 to 28 in. above this parting are the two so-called "3-Ft. Bands," about ½ in. thick and 3 in. apart. Over the coal is an average of 11 in. of drawslate, which invariably falls or is taken down, succeeded by 14 in. of "wild coal" high in sulphur and ash. As it makes a good roof, the wild coal is kept up where possible. Over it is shale.

In addition to one Joy 11BU and six 7BU loading machines, taken over with the mine, equipment includes two Jeffrey L-400 track-mounted loaders installed in November, 1938, and August, 1939. A Jeffrey 29-U cutting-and-shearing machine and a Jeffrey 56-A single-spindle track-mounted drilling machine were bought for one L-400 in development work. The other loading machines are accompanied by 35-B or BB shortwalls, the BBs replacing 28-A units. Also, a loading unit includes an air-driven auger drill and a Westinghouse 8-ton flameproof cable-reel locomotive. In all, seven loading units were working when this article was prepared, with two machines as spares or undergoing repairs. Eventually, it is planned to run eight units each shift.

All drawslate is loaded out of all main headings to get it out of the haulageways and also keep the airways clean. The same applies to haulage headings in face, or room, entries. Back headings and rooms and crosscuts, on the other hand, are widened where the roof is good to permit gobbing the slate. Where the roof deteriorates, however, places are narrowed down, forcing loading of much of the slate.

Full-retreat mining is the goal and is being achieved on the "West Side" by driving a main entry N. 68 deg. 59 min. W. to the line. This main entry follows one boundary and from it "face," or room, entries are driven S. 21 deg. 1 min. W. to the opposite boundary, a distance of nearly 1,300 ft. To supply coal in the interim a few panels are being mined down to the barrier as the main advances, but when it reaches its limit everything will go on full retreat.

Face entries then will be driven up and rooms started at the top to meet the pillar line, advancing on a 45-deg. angle. As the top rooms are worked out, new ones will be started below, as indicated in Fig. 1. Thus, pillaring will work down a face entry as the line advances until the entry is finished. The acreage making up the "East Side" lies in hilltops, which are being split by a main entry with face entries to either side to the crop to permit full-retreat operation.

This full-retreat system, as exemplified on the "West Side," as well as turning everything 60 deg., followed considerable experimentation. Originally, rooms were turned 90 deg. and were driven 21 ft. wide on 39-ft. centers. The practice was to start a face heading and mine rooms and pillars on one side as the entry advanced. When it reached its limit, room stumps, chain pillars and a barrier on the opposite side were recovered on the retreat. As the adjacent room entry was well up by that time, retreating usually was between two gob lines, with resultant squeezing, crushing of pillars, heaving of bottom and loss of coal, even under comparatively light cover.

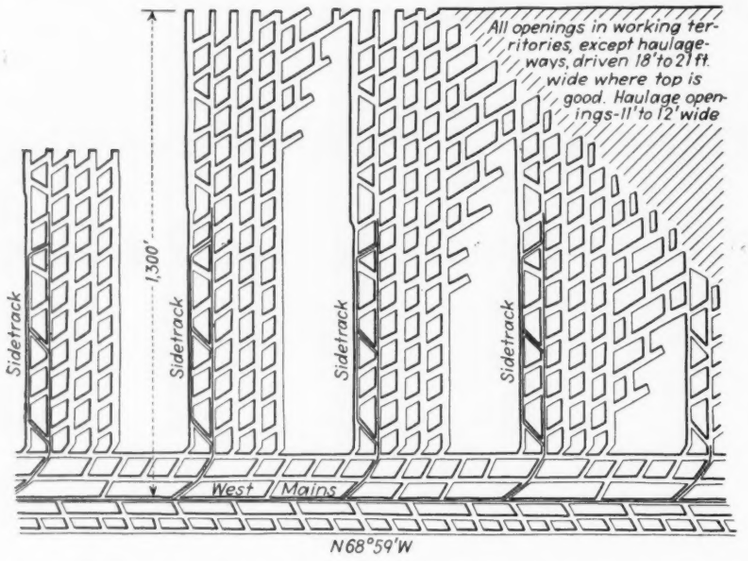
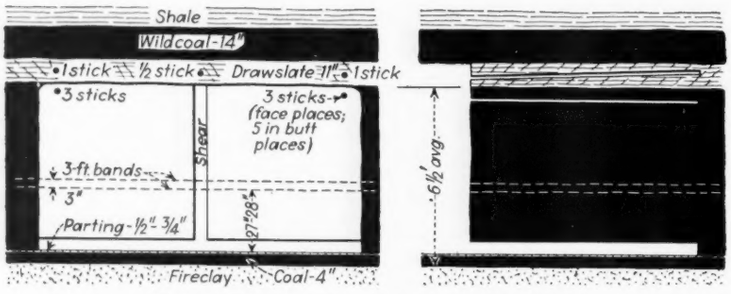
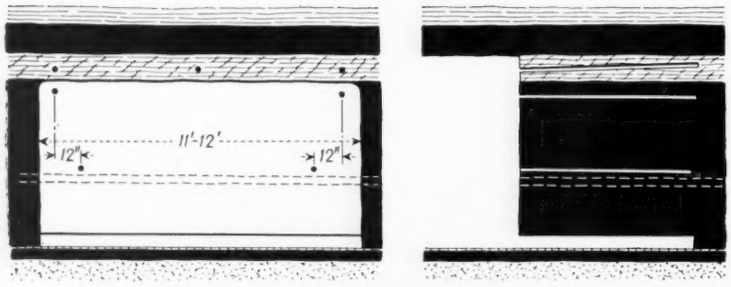


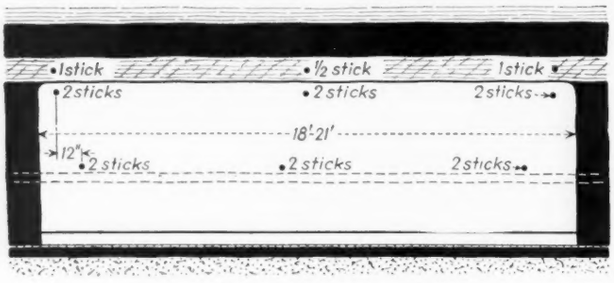
Fig. 1—Diagrammatic illustration of the full-retreat mining plan developed for Crescent No. 2 mine, using 60-deg. openings and diamond-shaped pillars.



Drilling Plan--Heading Undercut and Sheared



Drilling Plan--Undercut Heading



Drilling Plan--Wide Undercut Places

Fig. 2—Most-used drilling patterns for coal and drawslate, Crescent No. 2 mine.

The above difficulties were accentuated as the cover got heavier, with the result that Republic decided on full retreat with a continuous pillar line from the back of the property. Simultaneously, square blocks formed by driving 18- to 21-ft.-wide rooms and crosscuts on 80-ft. centers were adopted, still retaining the angle crosscuts in face entries. This resulted in a combination of square and diamond-shaped pillars, although it put most of the work on the face cleats.

But despite the desirability of working on the butts and faces, it was found that the necessary 90-deg. turns were a definite disadvantage, not only in starting new places with the track-mounted loading machines but also in haulage and equipment movement. Therefore, everything was put on 60 deg. While this has made certain face-preparation activities, such as shooting, somewhat more difficult, the difference has been far outweighed by easier loading and haulage and equipment movement.

With adoption of the 60-deg. layout, headings comprising a face entry were increased to five, as in the main entry, to provide, with crosscuts, a minimum of seven places per loading unit. Where possible, eight to ten places are preferred to provide plenty of room for slate-disposal in addition to other necessary operations.

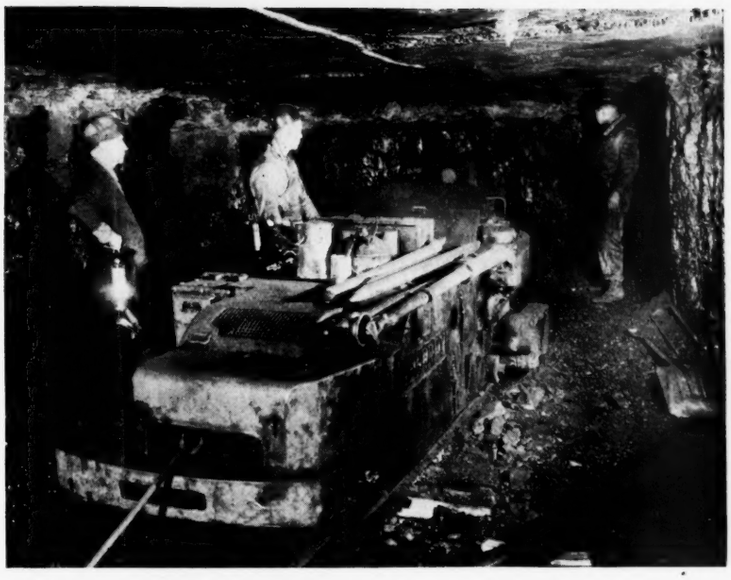
Face-entry headings are driven on 60-ft. centers, with crosscuts at 60 deg. on 80-ft. centers. Haulage-heading width is 11 to 12 ft. and the drawslate is loaded out. The same applies to the next heading, where track is laid for car storage. All other headings, however, where the top permits, are driven 18 to 21 ft. wide, the extra width being just sufficient for gobbing the drawslate. Rooms (Fig. 1) are turned on 80-ft. centers, measured along the entry, with room crosscuts staggered on 60- or 120-ft. centers, providing one or two crosscuts in a 240-ft.-deep place.

With places on 60 deg., the resultant pillars are diamond-shaped. Several pillar-mining plans are being

tested, including straight open-ending against the gob; pocketing through leaving a 2- to 3-ft. fender, shot if necessary; and pocketing, or splitting, leaving a fender two or three cuts thick for mining in two or three lifts. The goal is a plan under which the drawslate will stay up until each cut is loaded, as handling drawslate falling on the coal naturally involves a sizable time loss. Large pieces, when possible, are moved to one side with the loading head, while small stuff is picked up, along with a certain percentage of coal. Sometimes, the machine is stopped and the slate picked off. In other cases, the rear conveyor is swung and the slate dumped to one side for later gobbing.

Unit crews usually consist of eight to sixteen men, depending upon slate to be handled, clean-up activities, track and timbering, etc. In general, however, a crew will include a loading-machine operator and helper, cutter and scraper, driller and helper, shot-firer, motorman and snapper, one or two timbermen and two trackmen, in addition to the boss and slatemen if required. In development sections, where the slate is loaded out, two clean-up men shovel up loose coal, particularly on the clearance side. In other sections, this work is done by the slatemen.

Loading machines make their own clean-up. Then, the drawslate is shot, if not already down. Afterward, the slate is loaded out (narrow places) or gobbed (wide places). If it is loaded out, as in haulage openings, the loading machine returns to finish the job. A narrow place makes about one car of slate, and over the mine about one slate car is sent out for every five coal cars. In narrow headings, trackmen then clean up and square up the face.



Shearing a heading face in the "West Side" mains.

In wide places, the slate, after shooting, is broken up by the slatemen, who rick it along one side of the place, leaving, as a rule, a 12-ft. clear opening for the track. In general, the 6- to 8-ft. gob space just about accommodates the slate. Slatemen also pick up anything dumped during loading, square up the face, and keep the openings clean.

Extension of timbering, where required, normally is the next step. However, the wild coal, particularly in entries, makes a good top without much additional support. In rooms, 16-ft. crossbars are installed on 4- to 6-ft. centers. Two posts are set under the bars on the gob side, one at the edge of the gob area, 12 ft. from the clear rib, and the other under the end of the bar.

Cutting, or cutting and shearing, follows slate disposal, track extension and timbering, which are more or less interchangeable. Shearing (in the center) is done only in the "West Side" mains, using the 29-U machine, with 9½-ft. bar. In shortwall places, 7½-ft. bars, the shear naturally is omitted. Tipping bits with Borod was started in April, 1939. Machines now use an average of one set of bits a day, as compared with four sets before tipping.

Drilling follows cutting. At the same time the holes are put in the slate. In the "West Side" main headings, the 56-A machine is used; in other sections, air augers. Center-sheared places are shot with a hole on each

Caterpillar-type loading machine working on a cut through a pillar to the gob, Crescent No. 2 mine.

Track-mounted machine loading out of a new angle crosscut in the "West Side" mains, Crescent No. 2 mine.

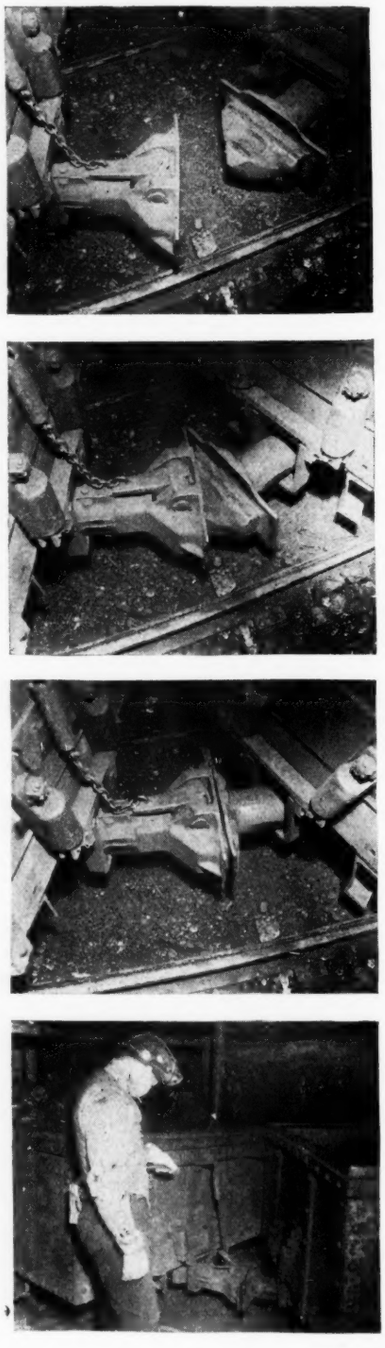
side, placed about as in Fig. 2. Three holes are drilled in the drawslate. Coal holes are loaded with three sticks of Monobel C each in butt places. In 60-deg. places—i.e., crosscuts—four sticks are required as a rule. Rib holes in the slate, if it stays up, are loaded with one stick each, with half a stick in the center. All shots are fired electrically.

Bottom-cut places 11 to 12 ft. wide are shot with four holes, placed about as in Fig. 2, with the two holes just above the "3-Ft. Bands" about 1 ft. in from the top holes to prevent cracks running and spoiling them. In places 18 to 21 ft. wide, six holes usually are drilled. In this case, also, the holes above the bands are offset slightly. Slate also is shot with three holes in wide places. Usual hole loading in coal in wide places is two sticks, using Gelobel A in the bottom holes and Monobel C in the top. The object of Gelobel is to break the bands and smash the bottom bench so the loader can dig in easily. As the coal is used for byproduct coke, coarse sizes are not so essential. However, a higher phosphorus percentage in the upper bench has dictated a slower powder and lighter shooting to increase 4-in. lump, which is screened out for gas use, thus eliminating that much of the high-phosphorus bench.

With the coal down, the place is ready for loading. As soon as there is room, Simplex roof jacks are set under the drawslate to assist in holding it, if possible, until loading is completed. Falls on the coal naturally result in a time loss in loading. Also, some of the rock gets in the coal. This represents, in addition to a loss in car capacity, a definite transportation cost to the tipple. Finally, freight must be paid to move the slate to the cleaning plant. Therefore, every attempt is made to hold the drawslate until loading is completed. Roof jacks have been found, to date, the best and cheapest method, although other means are being investigated.

Koppel steel cars holding about 4.8 tons mechanically loaded are used at Crescent No. 2. When a loading machine moves it usually is followed by the locomotive with enough empties (four to six) to accommodate half the coal (wide places) or all the coal (narrow places). Loaded cars are kicked into the nearest available place —usually the next crosscut back. Rooms are laid with 40-lb. rail on Bethlehem and West Virginia steel ties. This also applies to entries, with light rail and steel ties later replaced with heavy rail on wood.

Under the new mining plan, gathering locomotives will work from sidetracks in the face entries placed about as in Fig. 1. From the various sidetracks, two 15-ton intermediate locomotives pull to a main sidetrack, where a 30-ton General Electric machine, making a round trip every half hour, gets 40-car trips for the 4-mile haul to the river tipple. A dispatching system is planned to control the intermediate units and make sure that the sections get cars when, and only when, they need them.



Three stages in coupling on a curve in Crescent No. 2 mine, with (bottom view) a graphic illustration of how a coupler is unlocked from the side.

The 300 5-ton cars at Crescent No. 2 went in service in March, 1936. Equipment included Ohio Brass automatic couplers providing both spring draft and buff on 298. The other two have been fitted with new-type couplers in which the draft springs are replaced by rubber pads absorbing 50,000 lb. on buff and 25,000 lb. on draft with a ½-in. compression of the rubber. The new couplers also are equipped with a new inclosed centering mechanism which replaces the earlier exposed spring barrels and centering sling. Also, the new coupler requires only a simple recess in the car end for installation, as compared with the earlier unit, which was suspended beneath the car with two spring-suspension barrels and a centering sling on the end.

Male and female halves comprise the coupler with a cam for locking them in coupled position. Provision is made for releasing the cam to permit pushing cars without coupling. Coupling at Crescent No. 2 is automatic, even on horizontal and vertical curves, due to the spring-controlled play in the coupler half, as well as a design of halves which automatically guides them into locking position, except under extreme conditions. For unlocking the couplers from either side, double-ended levers are installed on the car ends. By raising on either handle, as shown in an accompanying illustration, the cam is lifted to unlock the coupler.

As there is no necessity, under normal conditions, for setting couplings, pulling pins, etc., by hand, injuries arising from coupling practically have been eliminated. In fact, only one lost-time injury due to coupling has occurred at Crescent No. 2 since the cars were installed, and this was due to kicking at a coupling head contrary to rules. Along with this, considerable time has been saved by eliminating missed couplings, breakage of hitchings, loss of pins and links, etc.

Except for the play in the draft and buffing springs or pads, trips are solid from end to end, eliminating jerking and bumping in starting and stopping and thus reducing spillage and wear and tear on cars and locomotives. And cars stay coupled. Crescent No. 2 has no record of an accidental uncoupling. Maintenance to date has been confined to replacement of a few springs which broke in cold weather.

[FIRST OF TWO ARTICLES ON THE NEW CASTLE GATE PREPARATION PLANT]

NEW UTAH FUEL PLANT

Assures Quality and Uniformity For Both Castle Gate and Clear Creek Coals

As tangible evidence of its faith in the future of coal and as a means of rendering continued satisfactory service to its customers, the Utah Fuel Co. last year built a new $350,000 central preparation plant to handle coal from its Castle Gate and Clear Creek properties. With an air-operated wash box, heat and centrifugal dryers, a complete "prescription - coal" blending plant and provisions for dustproofing all shipments, the new Castle Gate plant provides a mechanical-processing capacity of 250 tons per hour, with provisions for future increases.

By CARL S. WESTERBERG
Preparation Engineer, Utah Fuel Co.

And IVAN A. GIVEN
Associate Editor, Coal Age

DESIGNED to wash, size, dry, blend, and dustproof the product of two different mines with varying characteristics, the new central preparation plant of the Utah Fuel Co., at Castle Gate, Carbon County, Utah, adds "Castle Gate" and "Clear Creek" to the list of the fine mechanically prepared coals produced in the United States. Representing an investment of over $350,000, the new plant is distinguished by maximum accessibility, flexibility and complete integration of all preparation operations, particularly in the provisions for dewatering the fine sizes and their relation to other steps in the preparation process. Results have included a substantial reduction in the impurity content of the shipped product, accompanied by marked improvements in other factors affecting combustion results, not the least of which is a high degree of uniformity in quality, moisture content and size make-up.

"The building of this plant is tangible evidence of our faith in coal, the world's greatest source of fuel and energy," Moroni Heiner, president of the Utah Fuel Co., points out. It represents the latest of a long series of improvements in methods and equipment which have marked the 58-year history of the company. Throughout this period, Utah Fuel has consistently adhered to the principle that the good will of customers is the best assurance of miners' jobs, as well as protection for the stockholders. The measure of its success is attested by its enviable record to date and the fact that it has mined and sold more than 68,000,000 tons of coal, paying out over $81,000,000 in wages in addition to other millions for power, supplies, taxes and other items entering into the cost of the coal produced. The present Utah Fuel properties, comprising the Castle Gate, Clear Creek and Sunnyside operations in Utah, as well as Somerset and Calumet properties in Colorado, have a daily producing capacity of 5,500 tons (one-shift basis) and represent more than 500 miles of underground workings. In addition to the president, the executive and sales staff includes: Claude P. Heiner, assistant to the president; Joseph Parmley, secretary and purchasing agent; and Charles E. West, general sales manager. The mine operating staff is headed by W. D. Bryson, general superintendent.

The new Castle Gate plant is 115 miles southeast of Salt Lake City on the main line of the Denver & Rio Grande Western R.R. The elevation is 6,150 ft. above sea level. With one washing unit, the plant has a rated capacity of 250 tons of 3x0-in. coal per hour. However, conveyors and other equipment have been designed large enough to permit handling 400 tons per hour with the installation of additional washing and drying equipment in the future. And provisions also have been made for the future installation of additional conveying equipment to permit operation on a 6x0-in. raw feed. The new plant, designed and built by the Link-Belt Co., was installed just south of the original Castle Gate tipple, which continues in service to prepare sizes larger than 3 in., as investigation has shown that standard hand-picking and screening remain the best methods of preparing these larger sizes, which include 8-in. lump and 8x3-in.

Officials, directors and guests of the Utah Fuel Co. at the dedication ceremonies, Feb. 24, 1940.

stove, or a mixture of the two sizes.

Approximately the same list of coarse sizes is produced at Clear Creek, using substantially the same type of equipment, although Clear Creek facilities have been expanded and improved to facilitate handling and shipping of those sizes still prepared by hand-picking and screening: i.e., over 3 in. Thus, picking equipment was improved at Clear Creek in 1939 and three box-car loaders and loading booms were installed.

Coal Comes In by Rail

Clear Creek is some 35 miles by rail from Castle Gate and therefore 3x0-in. coal from this property is shipped to Castle Gate under a processing-in-transit arrangement with the D. & R. G. W. Storage tracks at Castle Gate will accommodate some 50 to 60 cars of raw 3x0-in. coal, and, inasmuch as the coal from each operation is prepared and sold separately, the practice is to prepare Clear Creek on separate shifts. As the Clear Creek tonnage is substantially less at present than Castle Gate's, little difficulty is experienced in working it into the plant operating schedule and keeping the raw-coal storage tracks clear.

Although all a part of the Mesa Verde group, the seams differ at the two properties. Castle Gate coal, derived from workings in three separate seams, is not quite so free-burning as Clear Creek, although harder in structure. The ash-fusion temperature also is somewhat lower (around 2,220 to 2,230 deg. F. after washing, as compared with 2,500 deg. for Clear Creek coal). Coal from both properties is classed as high-volatile bituminous.

The seam at Clear Creek is characterized by a persistent rock band near the top, from which a large part of the refuse content is derived. A fireclay bottom also contributes to the impurity content and some refuse is derived from the sandstone top, although the practice of cutting over the rock parting and leaving some 6 in. of top coal keeps down the quantity of this material in the raw coal. Usually, 3x0-in. raw coal from Clear Creek will be reduced to around 5 per cent ash by elimination of "rock" in the wash box and fireclay in the slurry. Sulphur at Clear Creek, largely organic and sulphate, with very little pyrites, runs 0.4 to 0.5 per cent.

Sulphur percentage at Castle Gate is about the same as at Clear Creek, while sandstone top and floor with all the seams are partly responsible for the ash content of approximately 6½ to 7½ per cent in the raw 3x0-in. coal, which is reduced to 4½ to 5 per cent, depending upon the size and other factors, in washing. Castle Gate coal also is characterized by numerous bony inclusions which vary in thickness and cut in and out at various heights. Ash-forming material in these bands runs 20-30 per cent and includes a high proportion (about 82 per cent) of calcium and magnesium oxides. In other words, the ash-forming constituents of the bone are basic in reaction, whereas the other ash-forming material in the coal is essentially acid in reaction, including, as it does, some 48 to 50 per cent of silica and about 20 per cent of mixed calcium and magnesium oxides. As a result, it was found that when 2 to 5 per cent of the bony material was added to clean coal containing only the acid-type ash-forming materials, an ash with a low melting point resulted, facilitating clinkering and slagging in both domestic and industrial equipment.

Bony Content Cut

In view of the above findings, it was concluded that any mechanical-cleaning system adopted should be able to reduce the bony content of the clean coal below the critical clinkering percentage; in other words, to less than 2 per cent. This, the washability studies showed, was entirely feasible and the resultant uniformity and protection against low fusion in certain shipments were powerful arguments in favor of mechanical cleaning for Castle Gate coal, along with the other advantages of mechanical preparation and the possibility of extending it to the Clear Creek production.

Uniformity was, in fact, an all-round factor in the choice of mechanical cleaning, and the ability to ship day after day a product of unvarying quality was considered particularly desirable in the case of the smaller sizes difficult or impossible to clean by hand-picking. Elimination of excess ash, which otherwise would have to be paid for and handled by the

purchaser, naturally was another major reason for new facilities, along with the desirability of equipment for shipping smaller sizes, in which the various size fractions could be accurately controlled to meet the particular requirements of the purchaser.

All Coal Washed

With mechanical cleaning clearly indicated as the best all-round solution to the problem of improving quality, the next question was the type of cleaning units to use. In this connection, a study was made of the possibilities of a combination wet-and-dry plant. Dry-cleaning of the fines was eliminated, however, because it was felt that the high moistures occasionally encountered (often as high as 6 per cent surface) in the raw feed would unduly reduce the efficiency of a dry plant. Therefore, wet-washing was selected for the entire 3x0-in. feed. The possibility of freezing in cold weather, plus the reduction in B.t.u. content resulting from excess moisture, dictated, however, the installation of equipment for heat-drying all coal under 1 in. Since it was felt desirable to eliminate troublesome fines from the finished product, it was decided to reject as slurry all material finer than 28-mesh. This move also was a factor in reducing fly-ash emission by taking small refuse particles and inert material out of the finished product.

As a result of the above reasoning, the new plant was set up to include washing equipment for 3x0-in. coal; classifying screens to make 3x1⅝-in. nut, 1⅝x1-in. pea, and 1x$\frac{3}{16}$- and minus $\frac{3}{16}$-in. residual sizes; primary and secondary cones to remove minus 28-mesh from the minus $\frac{3}{16}$-in. size and settle it for final dewatering and disposal; a screen-type heat dryer for 1x$\frac{3}{16}$-in.; a continuous centrifuge and a rotary heat dryer for dewatering $\frac{3}{16}$-in. x 28-mesh material; and a blending plant consisting of three bins with proportioning feeders for making various mixtures of coal under 1⅝ in. with the various size fractions accurately metered in the desired proportions. Auxiliary facilities include a crusher for all sizes over 1 in.; facilities to dewater washer refuse and slurry; refuse bin and disposal equipment; a stoker-fired furnace with controls, blowers and exhausters and ducts for the heat dryers; and equipment for dustproofing all sizes. Equipment units depart little from accepted standards, but inclusion of complete heat-drying facilities in the original plans, thus making it possible to accurately integrate them into the preparation cycle, makes the plant unusual in this respect.

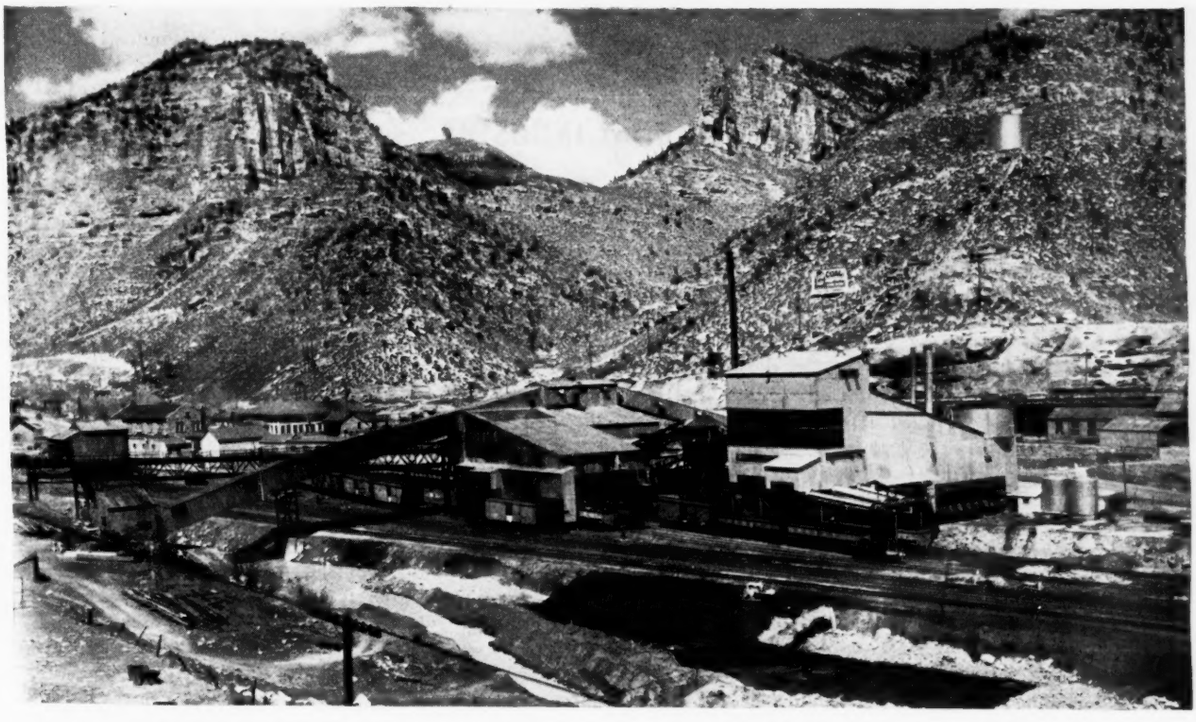
Construction was started in September, 1939, and a test run was made Feb. 13, 1940, with dedication ceremonies on Feb. 24. Results since that time have been summed up by Mr. West, general sales manager, as follows: "Actual tests on Castle Gate and Clear Creek coals show that they are running about one-third less in ash and burn with greatly decreased fly-ash; that they are making a much lighter and smaller clinker which has less tendency to slag or clog; that moisture can and is being controlled; and that absolute uniformity in quality and in any number of size blends can be and is being accomplished."

Laboratory Installed

Data for controlling the ash, moisture and size content of the product are supplied by regular sampling and analysis in a laboratory equipped also for the determination of B.t.u. content, sulphur percentage, ash-fusion temperature and volatile content. Sampling and analysis are handled by a chemist, an assistant and a sample man who prepares the coal for analysis, including grinding. Testing facilities also include a small water heater and stoker, supplemented by a fly-ash receiver. This equipment permits study of clinker formation and characteristics and fly-ash emission. Other facilities include equipment for determining friability and grindability.

(A complete description of the operation of the Castle Gate plant will appear in an early issue of Coal Age.)

Castle Gate surface works with the new mechanical-preparation plant at the right.



CAN COAL BENEFIT

By Organized Sales Promotion Based on Economy and Satisfaction in Use?

By JOHN F. SCHEETZ
Marketing Counselor

"TO HAVE and to hold from this day forth" will be repeated again and again during this month of June. It bespeaks confidence and faith and a belief in the future. As part of the marriage vow, "to have" and "to hold" connote a right vested in the contracting parties. And in that connotation they are practically synonymous.

In business it is quite different. "To have" is one thing. "To hold" is something else. A manufacturer with a market for a product holds it only so long as the buyers remain convinced that some of their limited dollars should be used for the purchase of that product. Proof of the statement, as far as the coal industry is concerned, is provided by a glance at the accompanying chart showing the declining percentage of energy produced by coal. This is a graphic presentation of the fundamental business principle that "to have" and "to hold" are not the same thing. With recognition of that fact comes the question of what to do about it.

In every major industry there always are those who express the conviction that the public is at fault, either willfully or through ignorance. Because an industry employs so many men, because it pays so many dollars in wages, because it has been in existence for so many years, because it pays so many dollars in taxes, because it uses so much raw material of one sort or another, because it maintains a generous pension plan, because it keeps the grass green in front of its factories, because its costs of distribution are low or high, or because it really isn't making very much profit, this group feels that the industry has a vested right to hold its business. The public, it is contended, should buy. In fact the public, in a way, is obligated to buy. If it really understood what a deserving industry this is the public would buy.

That kind of thinking is subjective, unsound and ruinous as far as sales, profits and progress are concerned. The buyer buys for just two reasons.

One is economy. The other is because he is convinced that the product has characteristics desirable or beneficial to him. He wants it regardless of price.

The picture of the declining use of coal is not unique in American industry. Many businesses have felt similar pains as progress in the arts and the power of superior salesmanship have combined to clear the way for new products. Some of the old ones have survived: namely, those smart enough to see the need for intelligent selling before it was too late.

Take ice, for example. Domestic sales of manufactured ice dropped from 57,000,000 tons in 1931 to 40,000,000 tons in 1936. During that period there had been sold some 7,000,000 mechanical refrigerators. They took $250,000,000 a year out of the iceman's pocket. Then the icemen got together and started to *sell*. They employed experts to design a better icebox. They offered the public ice in small cubes. They told the public of the advantages of the iceman's service. They made that service economical, convenient and desirable. Today they are happy again and can face the future with renewed confidence instead of alarm. But they had to work hard and fast and intelligently to hold what they had.

Next take the gas industry. Domestic sales of manufactured gas, exclusive of house heating, decreased 20 per cent between 1929 and 1936. Even including house heating, which was supposed to be a tremendous help, the drop in volume was 11 per cent. Years before 1929 the industry had lost its lighting load. Now electricity was making serious inroads on the key load: *cooking*. And both oil and electricity were being sold for water heating. In addition, public attitude toward the industry was unsympathetic. As part of the utility system of the country it felt the thrusts of punitive legislation. Morale in the industry was at a low ebb. In many ways the situation was similar to that in the coal industry today.

Realization that "to have" and "to hold" were two different things caused only discouragement. And the industry could not blame the depression because, during the same period (1929 to 1936), sales of electricity had gone up 30 per cent. The future

looked grim. Then something happened. A study of the industry and its problems revealed some facts that brought it to its feet cheering. There was no reason for it to die. There was every reason why it should live.

First of all, here was a sound essential industry backed by 100 years of experience and an investment of over $500,000,000. It could not be allowed to die. Second, here was an industry with over 16,000,000 customers on its books. Most of them were satisfied customers. But only a few of them were getting the full benefit from the service available and few had any appreciation of the merits of the service. All they noticed was a bill once a month that they thought was too high. Third, competitive fuels and services were being presented in the most appealing modern selling, merchandising and advertising fashions. The public was responding to those appeals without regard to the relative merits of gas, though they had been using gas without dissatisfaction for years.

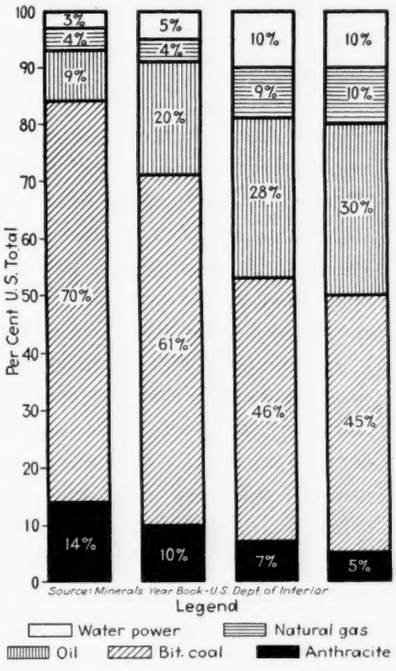
Fourth, a survey covering representative users throughout the country showed the effect of this competitive selling effort. It indicated that the complacent inertia of the gas industry was responsible to a large extent for the success of competition. For example, in talking about ranges, a majority of those interviewed expressed a preference for electric ranges because they were insulated and had automatic heat control. Both of these improvements were incorporated in gas ranges before electric ranges were out of swaddling clothes, but the public did not know it. People even expressed a preference for electric ranges because they believed that so-called "waterless" cooking was possible only with electricity. Waterless cooking was a fad promoted by the electric people to get around the inherent difficulty that electric ranges were slow and, in most places, expensive to operate. But the selling job was well done. It was so well done that the public was beginning to believe that "beans and biscuits knew what made 'em hot"—and that electricity was what they wanted.

Gas Industry Was Asleep

Fifth came the realization that the gas industry simply had been asleep. It had been outsmarted by a very much awake young upstart. The job had been so well done that even some people in the gas business had actually come to believe the oil and electric stories that gas was an outmoded fuel.

In the face of that situation, "to have" and "to hold" had entirely different meanings. Something had to be done and done promptly to hold what was left. It was evident that the only way to meet the onslaught of modern sales technique was to launch forth with some of the same.

So those gas men who had not been lulled into complete unconsciousness by the years of little competition went to work. Their first and most difficult task was to rouse the others who were asleep or who were awake and thought the task hopeless. They kept at it and



Percentage of the national energy demand supplied by coal for years 1913, 1923, 1933 and 1937.

at it, adding as cohorts one group after another. Finally, and to their own amazement, after six short months they had 80 per cent of the industry behind them.

Today, after five years of sound promotional effort the industry is happy, healthy and going strong. Not only has the downward trend in sales been stopped—it has been reversed. Total sales *and* revenue *and* profits actually are going up. In 1939 the operating companies sold more gas than ever before. Prospects for 1940 are even better and morale is at a new peak. That, in itself, means improved labor and public relations.

The coal industry has, to be sure, some problems that are different from those of the ice, gas, wall paper, milk bottle, automobile and other businesses. Every industry has certain problems that make it different. But each has one problem in common with the others: holding its volume of business against the competitive appeal of other products. And to hold that business and to grow, it must sell, sell, sell.

Public Not Easily Sold

The days of the "mouse-trap theory" are over. The public will not beat a path through the wilderness to anyone's door today. The butcher, baker, candlestick maker, distiller, furrier, automobile manufacturer and electric refrigerator man all are providing broad, smoothly paved, scenically beautiful roads to their doors. Even so, they do not wait for Mr. Public to come to see their beautiful factories and their contented cows. They go to his door. They get in. And then they sell him something. Industries don't die. It is the energy and the will to do, the imagination and enterprise behind them, that flicker and go out.

As a result of renewed enthusiasm and the intelligent application of effort, more gas is being sold today than ever before. Yet five years ago, the gas industry was considered a dying industry. More candles are being sold today than in the days when candles were an important source of illumination. Bicycles—thought of as a business that could only enjoy reminiscing about the good old days—are being made in greater quantities than when they were an essential means of transportation.

Is the outlook for coal any less promising than the one those industries had to face? The answer is "no." But, in the case of coal, as of gas, desired results can be accomplished only through hard work and a strong, organized sales promotion effort. The objective of that effort must be to convince the public of the economy, dependability, cleanliness and satisfaction to be derived from the use of coal.

Responsibility for getting that effort started rests squarely on the shoulders of the leaders of the industry. Those who are not leaders will not have the vision or the ability or the energy to tackle the job. The penalty for starting it will be a lot of extra work. The reward for getting a real campaign successfully under way will be the assurance that coal will continue to have a place in the market for fuel; that coal will be able to hold its own against all comers—at a profit.

SECOND ARTICLE OF A SERIES ON VENTILATION FOR FOREMEN AND OTHERS

RETURN OF AIR TO MINE

Should Be Prevented by Providing Entrances and Exits Remote From One Another

QUALITY of air in the mine, as elsewhere, always is more important than quantity. Therefore, it is necessary that the air, after once it has left the mine with its explosive and unbreathable gas, should not find its way back to it and be recirculated through the workings. It is regarded as distinctly unfortunate if the air leaving the mine has as much as 1 per cent of methane, and most managers try to keep that figure as a maximum. Some have had to keep down production in order to lower methane content to a safe percentage. However, in one mine it was found that on one occasion the intake at the mine opening already had 0.52 per cent of methane (*Coal Age*, June, 1930, p. 382); hence it was difficult to keep the quantity of that gas in the return down to 1 per cent.

Suppose that 400,000 cu.ft. of air per minute is being passed through the mine, that it contains on entering 0.25 per cent of methane and that the return air has 1 per cent of that gas. The same result could be obtained with only 300,000 cu.ft., if the air introduced into the mine were free of methane and the return-air percentage were still kept at 1 per cent. Evidently, 100,000 cu.ft. of air per minute is being as good as wasted and, as the power needed to drive the air varies as the cube of the quantity of air being driven, the power required will be 2.37 times as much as would be needed if pure air alone were allowed to enter the mine. And the power bill is one of those big items that must be kept low if the mine is to show a profit.

Fortunately, return mine air, being under lower pressure than the intake, cannot get into the latter except on the outby of a fan—main, booster or auxiliary. There the usual conditions

Where does all the methane in coal mines come from? Sometimes part of it comes from the air which the fan or the mine opening is breathing. The air that goes out of the mine turns round and goes right back into it again, carrying its firedamp and blackdamp with it. The fan that drives it out will suck it back in as readily as it will pure air. Furthermore, why take air through the mine and then take it back again to almost the same place as it started from if it does not have workings to ventilate on its way back?

in the mine will be reversed, for the fan draws air by lowering the pressure on one side of it, so that it becomes less than the pressure of the return air. Intake air, on the other hand, can readily leak into the return all through the mine if ribs and stoppings are not tight, which is indeed wasteful but not menacing to life and property. In fact, such air should improve the quality of the return current, and often does so even where there is no advantage to be gained from such an improvement. The return air, however, can get into the intake on the outside of the mine, and probably does so more often than is suspected. In fact, at that point the fan has either (1) raised (see Fig. 1*a*) or (2) lowered (see Fig. 1*b*) the pressure at its orifice, so that, in the first case, the mine air is driven from the fan into the atmosphere so forcibly that it can readily enter the mine intake or, in the second case, air is being drawn into the fan and the higher pressure of the escaping air in the return tends to cause a flow of mine air in that direction. Thus mine air, whether the fan be a suction or pressure unit, can be recirculated and made to pass through a mine a second or more times.

In the first article of this series, it was shown how recirculation was possible if the return air could get into the intake air behind—that is, outby—a booster fan. This is true also of the main fan and of auxiliary fans. Only by the power of the fan can the return be made to enter and mix with the intake. Return air can be added to intake air only when intake and return atmospheres are in position to pass together through the fan, though the intake, because its pressure always is higher than that of the return, can be added to return without any fan being present to assist in mixing the gases. Of course, atmospheres, when they are in contact, can mix by diffiusion, but that is a slow process.

Wherever the intake drift or slope is near the fan opening or where the intake shaft is near the fan shaft, there is danger of recirculation, especially if both entrances are in a deep valley, if the prevailing wind blows from suction fan to intake or from return to pressure fan, or if heavy clouds keep the mine air from ascending. It will be remembered how one night in a mountainous part of Belgium, many persons were smothered or poisoned by industrial gases held down, it was believed, by heavy masses of cloud which hung over that region. Some persons died as a result.

But one does not have to imagine high cliffs, deep valleys, mountains,

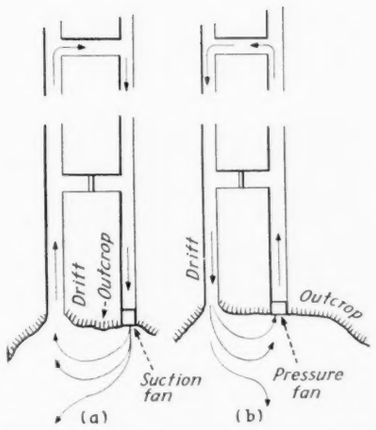


Fig. 1—*(a)* Fan is drawing air out of the mine and most of it is going back into the drift again. *(b)* Air is leaving drift and being drawn by fan into mine, where it will make its trip a second time. What good does such circulation do? It should be termed "circulation" rather than "ventilation."

winds or masses of cloud when differences of pressure of 2 to 4 in. of water gage are found within a few hundred feet of each other with no barrier between them. (Where both intake and return are in the same shaft the distance between them via the fan is much less.) As 4 in. of water gage is about 0.3 in. of mercury, it is easy to see how it can start a wind of its own in the direction of the lower pressure.

It will be noted that when fires are lighted near an intake shaft, how smoke is drawn in that direction. With a small mine and a ventilating current of little volume and water gage, the action of the fan is not noticeable, but, where a large volume is taken into the mine, and the water gage is high, the fan sweeps the valley in which it operates. With a suction fan, a stack would compel the air to travel up into the upper regions of the atmosphere, but even then the expelled air from the fan might be compelled to descend by the pull at the mine entrance, shaft, slope or drift. A better way is to find a new and distant location for the fan, and then use both intake and return airways as intake airways (see Fig. 2).

One might conclude that because dry air is 1.8 times as heavy as methane, the latter gas on leaving the mine should rise rapidly and not be drawn into the entering current, and indeed the speed of the air leaving the mine under the propulsive force of the fan does cause the air to rise rapidly for some distance regardless of gravimetric considerations. However, the air leaving the mine has the methane diffused through it, so that it is the specific gravity of this methanized air

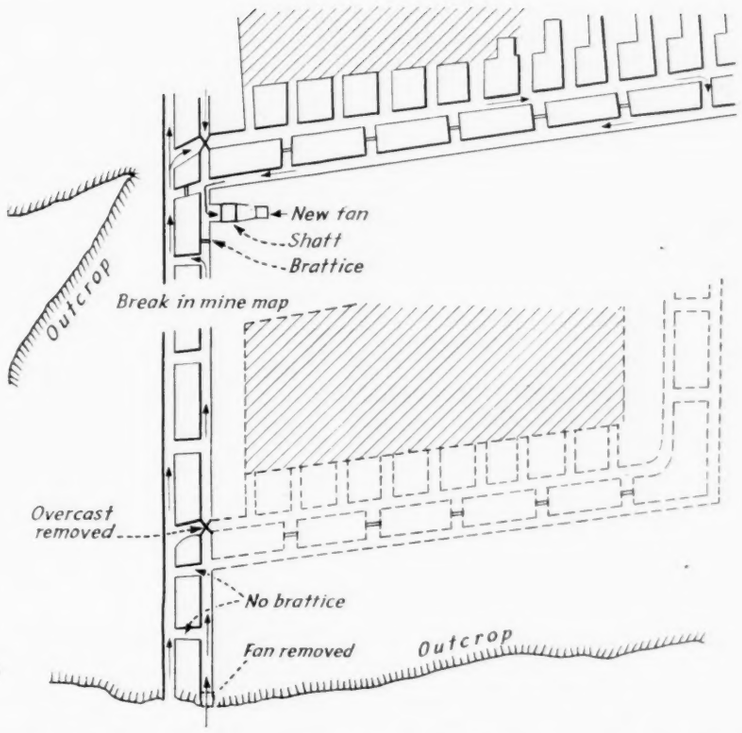


Fig. 2—Fan has been placed where it saves the air from making the long travel back from mine workings to the old fan drift and where air from fan and outside air at drift cannot mix, so there is no recirculation. The workings in the heart of the mine are not shown, as new fan location is supposed to be miles distant from old fan location.

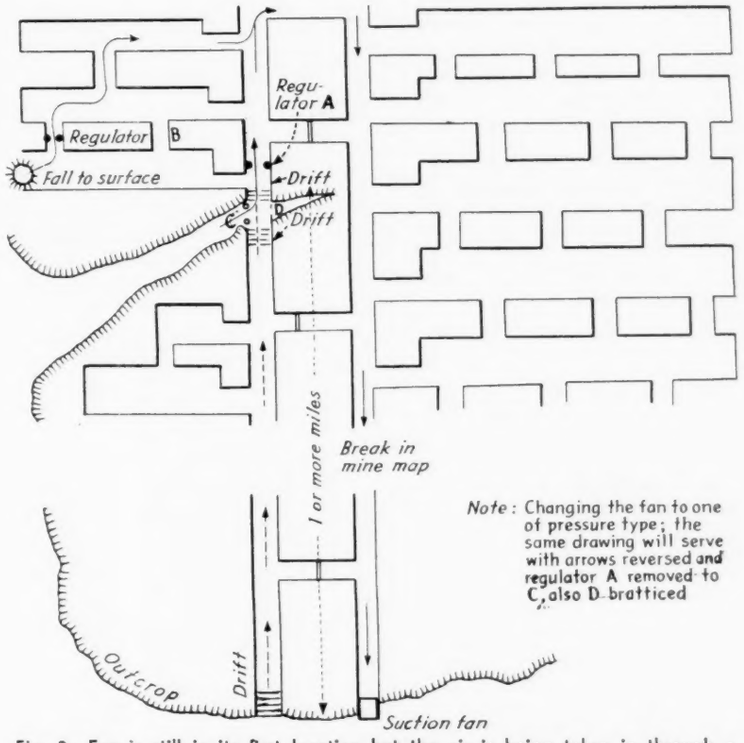


Fig. 3—Fan is still in its first location but the air is being taken in through a drift in a valley and through a roof fall which has opened a hole to the surface, though a little air still enters the main drift, but so little that entry of methane from fan will be almost negligible. Plan reduces resistance and freezing in principal roadway.

that has to be compared with the specific gravity of the surface air. In this connection, no purpose is served by comparing the gravities of pure air and pure methane.

Assuming that both surface air and mine air are at the same temperature and pressure, and neither contains carbon dioxide or moisture, if the mine air carries 1 per cent of methane, the surface air will be only 1.00443 times the heavier of the two. The effect of this difference in specific gravity would be wholly eliminated if the mine air were at a temperature 2.30 deg. F. lower than that of the surface air, which, of course, often happens. There may be as much as 40 deg. of difference, for the surface temperature may be 95 deg. and the mine temperature only 55 deg. F.

Thus, disregarding moisture and carbon dioxide, the air leaving the mine in summer almost always should be disposed to fall, not rise, and only the impulse of the fan gives it an upward urge. In some sections of the country, air entering the mines in the summer often is nearly saturated at surface temperatures. When it enters the mine, it leaves water on ribs, roof and floor, still remaining saturated, but at the lower temperature of the mine. This saturation the air has on emerging, but it has less moisture and therefore more weight per cubic foot than when it entered. (Of course, the reverse is true in arid sections.)

To the heaviness, therefore, due to the coldness of the mine air, is added the heaviness due to the loss of water that results from that chilling. Hence, no matter how far up the fan may throw the air and stacks may carry it, it will fall rapidly in summer unless the winds lift it or mix it with other air. Water vapor is only about an eighth heavier than methane, and dry air is 1.6 times as heavy as water vapor.

The water content of saturated air at 55 deg. F. is 0.9028 per cent of the mixture and at 95 deg. F. is 3.432 per cent. Thus at a maximum the loss of weight of water in passing through the mine is much greater than the gain in weight of methane and therefore may be far more important, despite the greater lightness of the latter.

In summer, for these reasons, recirculation of mine air might be regarded as more likely to be prevalent than in winter, for the output of carbon dioxide that depresses the effluent air and of methane that raises it remains constant regardless of the seasons if not regardless of atmospheric pressure.

In the winter, the relatively warm, moist air from the mine enters the intensely cold atmosphere. At first, the mine air is so relatively light that it tends to rise rapidly, just as the moist atmospheric air rises from sun-heated, relatively warm moist land to form the cirrus clouds which we see floating at immense heights, but eventually these clouds become cool and then they descend as nimbus clouds which are full of the condensed water we know as rain. Similarly, but far more rapidly because of the greater difference in temperature and the larger volume of cold air, the mine air becomes cooled, and the moisture condenses to form a descending fog that will prevent the ascent of air from the mine opening. Thus, neither in the height of the winter nor in the sultry summer days will the air tend to travel upward any considerable distance.

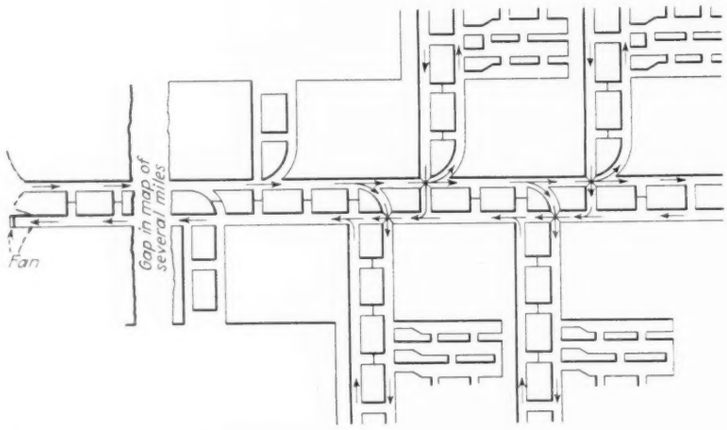


Fig. 4—With "air circulation" the air returns almost all the way back to the point from which it started and some may even return the entire way and make recirculation possible. Besides, dust and gas are carried nearly the full way back to the point where the air entered the mine, and recovery of such an operation after an explosion will be made difficult, for the stoppings may be blown out for miles.

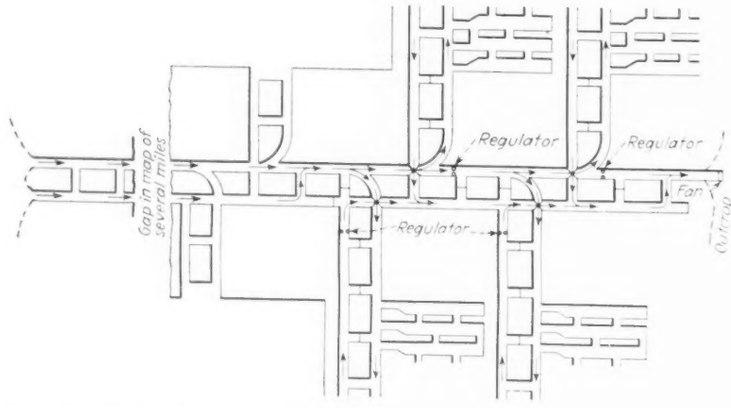


Fig. 5—With "unidirectional ventilation," another form of "air travel," the air enters at one point, passes through the workings, and goes out at a distant point. The air utilizes what originally were returns as intakes and so cuts the resistance in the straightaway ventilation one-fourth. Recirculation is made impossible where unidirectional ventilation is installed; thus the mine is made safer.

Recirculation Outside Mine

Recirculation, in one way, is more troublesome on the outside of the mine than in auxiliary ventilation underground, for with the latter the air is taken from one point on the intake and returned to another further along the line. If, with auxiliary ventilation, air does not recirculate, it is because of the velocity with which the main air current definitely is traveling.

For recirculation, the exhaust of the auxiliary current would have to cause a part of the main current to halt and reverse its direction. This is not easy, it is true, but it may and does happen frequently with an auxiliary fan, which has invariably a water gage of a few inches whereas the fall in pressure in the main air current between the auxiliary fan and its return is only a few hundredths of thousandths of an inch.

If it were not for the power in the air due to its motion, the auxiliary fan would draw air from points a long way down the heading. On the other hand, with the main fan, the exhaust on arriving at the surface may be stopped either by stagnant air or helped in its passage from return opening to intake opening by favoring atmospheric currents.

It may be possible, especially where in places the workings are shallow, to provide another opening or other openings to the mine (see Fig. 3) so that the air may enter or leave mostly at distant points and not in such large quantity in or out of the main haulage opening. In that case, with a suction fan, to be specific, much of the air will not have to travel all the way out to a point near the new intake and then travel through near-by live workings only to travel back again to the fan. Instead, most of it will travel merely from the new point of intake through the immediate live workings and thence to the ventilator, and the air will not be contaminated by travel from the main opening of the mine to the new point of intake, and much power will be saved.

Air Access From Surface

However, where the nearness of the fan to the main opening is most important is in a very gassy mine, and there the workings usually are so deep that the sinking of a new shaft for ventilation, as suggested in Fig. 2 for a drift mine, may be a major undertaking and one that does not lie within the functions of a foreman. In shallow mines, on the other hand, opportunities for the construction of short shafts, inexpensive drifts and cave holes are frequent and their possibilities should be considered.

Many outcrop workings break up to the surface and will let air into the mine or, if the air in the mine is under pressure, will let air leave the mine. This is desirable so long as one does not lose air before it has completed its work and so long as fresh air is not permitted to enter the return. This return may be too high in methane, it is true, but the place to reduce the methane content is at the working face and not in the return. The fact that the return is too gassy for safety is usually a sign that it is still more too gassy at the working face, though that is not always the case. However, near the outcrop this is invariably true, as there is little methane emitted at that point, and some fresh air is almost sure to leak into rooms which are driven so close to the surface.

So much has been said about circulation of air that too many have the idea that the air should return almost to the point from which it started, as in Fig. 4. The ideal arrangement is to have the air travel over as much of its course as possible in one direction only and then escape to the surface (see Fig. 5). Or the air may be taken into the mine near the live workings, be drawn through them, and then be drawn to the fan. Unidirectional flow is what such a ventilation scheme is termed. Air, in such a case, does not travel far along returns which parallel the intake by which it enters the mine. Unfortunately, the greatest opportunity for unidirectional flow is mostly in mines under light cover where openings can be made to the surface here, there and everywhere, and mines with such opportunities are now fewer than before.

However, today shafts could be made more frequently than formerly, for they can be sunk cheaply and expeditiously by churning drillholes of 18 or 24 in. diameter and then enlarging them, dropping the material down to the seam and hauling the refuse to the surface. With such arrangements, there is no trouble with water or air in sinking. The churn drillhole takes care of that difficulty, but if methane should leave the mine at such a point in quantity it might be unsafe to shoot the rock.

Perhaps before long it will be customary to drill and lift out of the ground cores of rock and earth of 5 or 6 ft. in diameter and thus make airholes, even of great depth, inexpensively.

Where a centrifugal fan is used, the fan should be inspected to see whether it is recirculating too much of its own air (see Fig. 7). Some recirculation is inevitable, for the fan blades must not actually touch the casing at the lip or cutoff, where they return to get another load of mine air, but this fit should be as tight as it can be made; without risk, however, of actual contact or collision between fan blades and cutoff. Some have found a large flow of air entering the chimney of a centrifugal fan on the side near the blades, while a much larger volume, of course, was leaving on the other side of the chimney.

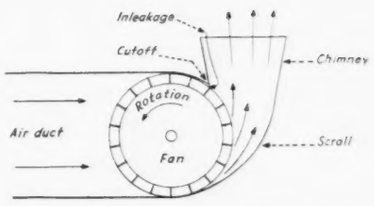


Fig. 7—Centrifugal fan. Here air leaves chimney and some of it is drawn in by the fan to be swept around by the blades and to come out again. This wastes air but doesn't return foul air to mine workings.

This recirculation probably is confined entirely within the fan or a few feet therefrom. It will not return methane to the workings. If it creates a hazard in a gassy mine, it is because it raises the methane content within the fan, which methane might be ignited by mechanical sparks due to contact or collision between blades and cutoff. Wherever, because of high methane content, that is a possible source of an explosion, it is not well to be too greatly disturbed about a little loss, as the cure—a tighter fit—is likely to cause sparks which will ignite the methane. The real objection, therefore, is wasted effort. The recirculated air requires as much power for its pressuring as the air which passes through the mine.

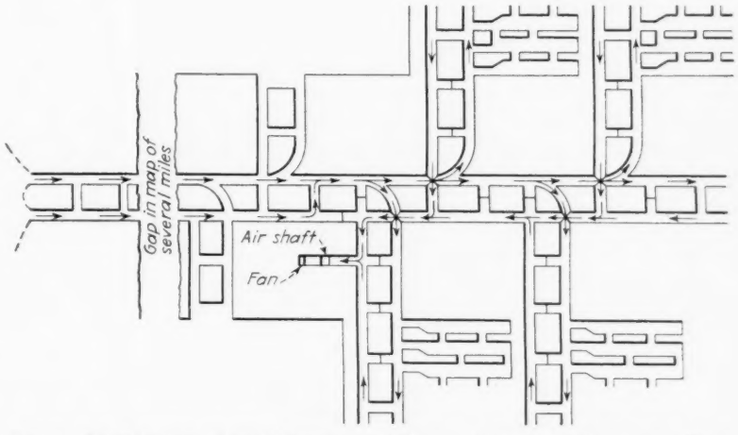
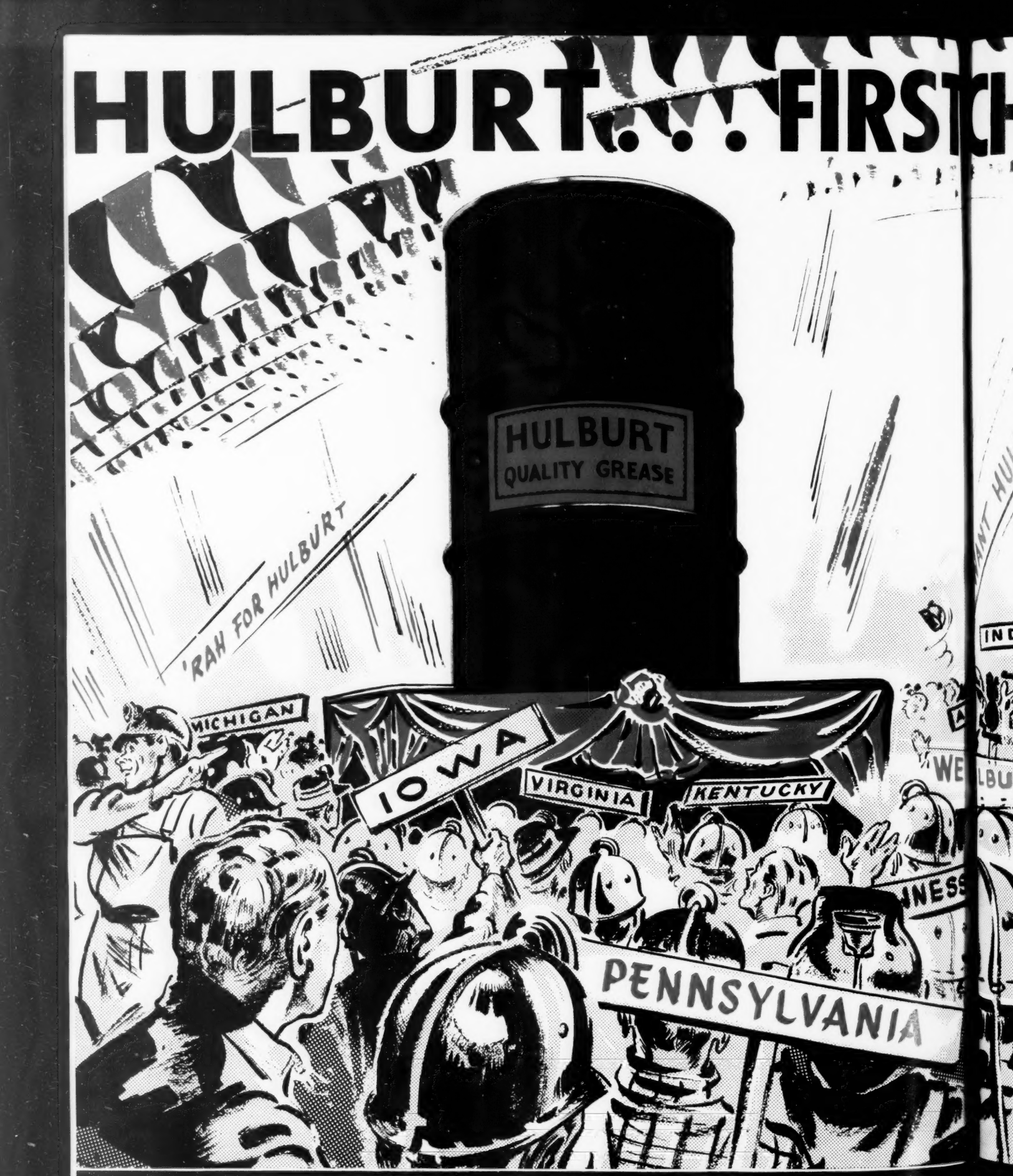


Fig. 6—Combination of straightaway ventilation and air circulation, a condition found at many mines.



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THOUGH BURIED IN SLUSH

Anthracite Ribs Skipped and Drawn With Aid of 12-In. Belts Running in Troughs

Despite heavy cover, irregular pillars in the Pittston bed, at No. 14 Colliery, though weakened by long standing, were successfully extracted by the Jermyn-Green Coal Co. Squeezes upset all calculations so long as the coal was skipped and loaded directly by hand into mine cars. Driving skips wide enough for this purpose weakened the slushed pillars, so belts were provided to carry coal and also slush, which latter sometimes was unloaded by plowing it off the belt into the gob by a board. When skipping, each man produced 8 net tons per shift. While depillaring, 11 net tons per man was the usual output.

By ELKINS READ

Consulting Engineer
Jermyn-Green Coal Co.
Pittston, Pa.

NEARLY a century ago when the first miners were coming to Pennsylvania from the British Isles and anthracite had just begun to move to market over narrow-gage gravity railroads and in mule-drawn canal boats, little was known of the art of pillar drawing, and it is not strange that, in such early mines, small pillars were left. The plan at that time was to mine only on the advance and recover as much coal as possible in so doing, leaving pillars just large enough to prevent collapse.

Unfortunately, however, this end was not always attained and some rather disastrous squeezes ensued. To avoid occurrences of this kind, the companies later operating in those areas filled the old workings with slush from their breakers, using material below $\frac{1}{16}$-in. mesh and passing it into the mines through boreholes from the surface.

This plan was adopted years ago to support the roof of the celebrated Pittston bed in No. 1 section of No. 14 Colliery, at Pittston, Pa., now operated by the Jermyn-Green Coal Co., which section was part of old No. 2 Slope, one of the oldest mines in the Wilkes-Barre-Scranton district. It was first worked in the early 1840's, and the coal was shipped to market over the old Pennsylvania Canal, which had been constructed along the Susquehanna River.

At No. 14 Colliery, the principal basin parallels the river consistently for a considerable distance, but back a short way from the main basin are numerous lesser synclines and anticlines. In the early days of No. 1 section, electric pumps, hoists, locomotives and underground conveyors were unknown, so all cross entries had to follow the contours of the coal bed and all chambers had to be driven in directions that would make them flat enough for mule haulage. This explains the lack of uniformity in the direction of the chambers and cross entries which the accompanying map illustrates.

Including all three main benches, the thickness of the Pittston bed is from 9 to 15 ft. The top bench is 18 to 30 in. thick; then comes a black slaty rock varying in thickness from 1 in. to 3½ ft.; below this is the "breast" bench, ranging from 4 to 7 ft. thick, overlying a 6- to 10-in. layer of rock. Under all these is 3½ to 7 ft. of bottom coal.

The main roof is of sandy shale, changing occasionally to sandstone, and over the coal is a treacherous drawslate which must be watched, the thickness of which averages 6 in. But the blade rock under the top coal is the main hazard, as it is full of seams, so that it falls almost without warning. The main roof is comparatively brittle and is easily broken except where it consists of sandstone.

To the north of Farmers' Road, the coal bed in No. 1 section rises somewhat regularly in a southerly direction at a gradient of about 15 deg.; thereafter, it becomes irregular with local dips and hills until it reaches Robinson's Road, where it again becomes more uniform, a consistency which continues to the southern boundary.

An area measuring roughly 1,200 x 2,500 ft. in the southeastern corner of the property and lying between the main basin and the southern boundary had been slushed more or less completely before the mine was reopened, especially to the north of the eastern end of Robinson's Road. But near that road in the section of the mine marked *A*, the tightness of the backfilling was questionable and in that section four counters were driven diagonally across the old chambers so as to obtain access to the old pillars.

Some of the chambers were found to contain no slush and others were

only partly filled, so second mining started in the extreme southeastern corner in pillars of an average width of 25 ft. The old chambers were cleaned up, tracks were laid to the face, and successive cuts were made on the inby ends of the pillars until the coal, shot off the solid and hand-loaded into mine cars, was entirely removed.

However, as the extraction retreated north toward the Third Counter, the slush became deeper and cleaning of the old chambers became so expensive that it was necessary to advance along the chamber roadway in a skip driven up along the side of the pillar, thus avoiding the handling of the slushed material. But, to make room for mine cars in the skips, so much coal had to be removed that nearly all the pillars squeezed before the skip reached the inby end of the chambers. Shakers would have been used, but the floor undulated too much to permit of their use.

On reaching the section marked *B*, skips were driven only in every other pillar and about half way up the length of the room, as at *X* in pillar No. 3. When this point was reached, the road was turned left and a crosscut driven through No. 3 pillar. Then the slush was loaded out and the road laid across the intervening chamber No. 2 so that the upper half of pillar No. 2 could be skipped and brought back. While this was being done, the lower half of pillar No. 1 was being removed. Then the upper half of pillar No. 3 and the lower section of pillar No. 2 were pulled.

Although all these places were triple-shifted, pillars were drawn back so slowly that even before the upper ends were reached, the lower parts of the several chambers were badly squeezed and had to be retimbered. This, with the expense of loading out slush in the old crosscuts as well as driving across the intermediate chambers, made the cost prohibitive.

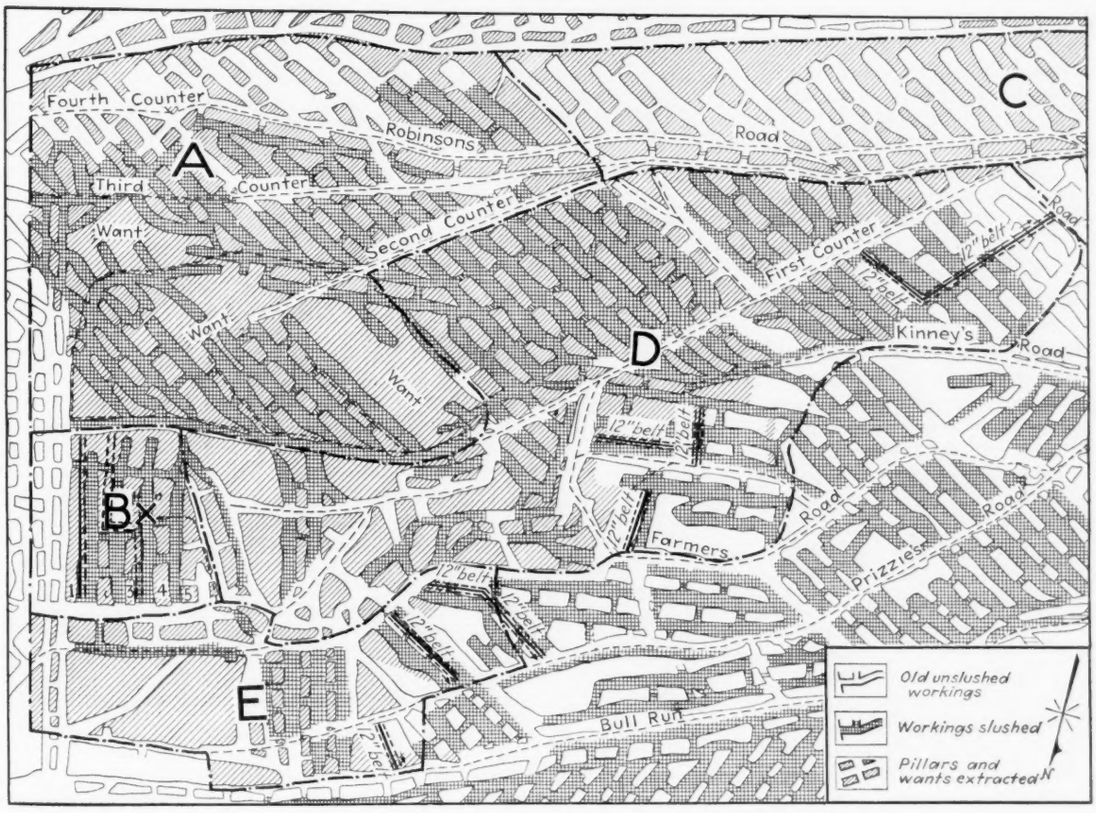
To eliminate squeeze and concentrate operations, the distance between counters or haulage roads was cut from 300 to 150 ft. and, instead of cutting skips in pillars wide enough for hand loading into mine cars, 12-in. belt conveyors were used, designed by the writer and built in the colliery shop. By these belts costs have been greatly reduced and output per working place has been practically doubled. Three men now work in each place instead of two, and the width of the skip has been cut to 7 ft.

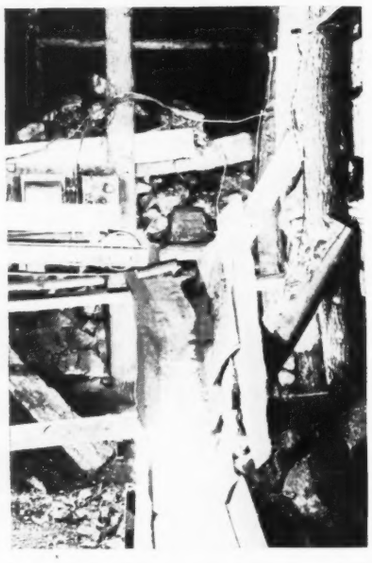
When roof conditions are good, a single row of props, 6 ft. apart, is set along the slush side and lagged with slabs. Where roof is bad, cross timbers are used, and where old crosscuts have to be crossed, enough coal is taken off the end of the pillar to afford storage space for the slush dug out of the crosscut, but if the crosscut is wide, part of the slush has to be loaded out.

Crews consist of a miner and two laborers. One of the latter tops the car while the other two load. All coal is shot off the solid, and the work is done on contract. Production averages 8 net tons per man when driving the skip up the pillar and 11 net tons coming back, or 20 to 30 net tons per shift. The places work three shifts per day. It is now found that if the mine works four days or more each week, the pillars can be skipped and excavated before any part of them is excessively weighted.

Conveyors consist of a 12-in. 4-ply

Pillar-pulling operations at No. 14 Colliery ultimately were made efficient both in labor and percentage recovery by using belts (thus permitting narrower pillar skips) and by driving counters at 150-ft. intervals to serve as approaches to the chambers being depillared. The map shows how the pillars were drawn. Only part of the mine is shown.





This 12-in. belt is transferring its load to another belt of the same size.

rubber-covered belt running in continuous pans 12½ in. wide with 4-in. flared sides, powered by a 5-hp. tandem drive. The pans are made of 10-gage sheets, 5 ft. long, with a ⅜ x 1½-in. band on each end, bent at right angles so as to engage the slots in the supporting stands. The belt slides over the bottom of the pan and has no rollers. The return belt is carried on ¾-in. pipes held in place by ½-in. rods instead of idlers. The drive pulleys are of 8 in. diameter and lagged with rubber ⅛ in. thick. Head and tail pulleys are equipped with flanged-type self-aligning roller bearings.

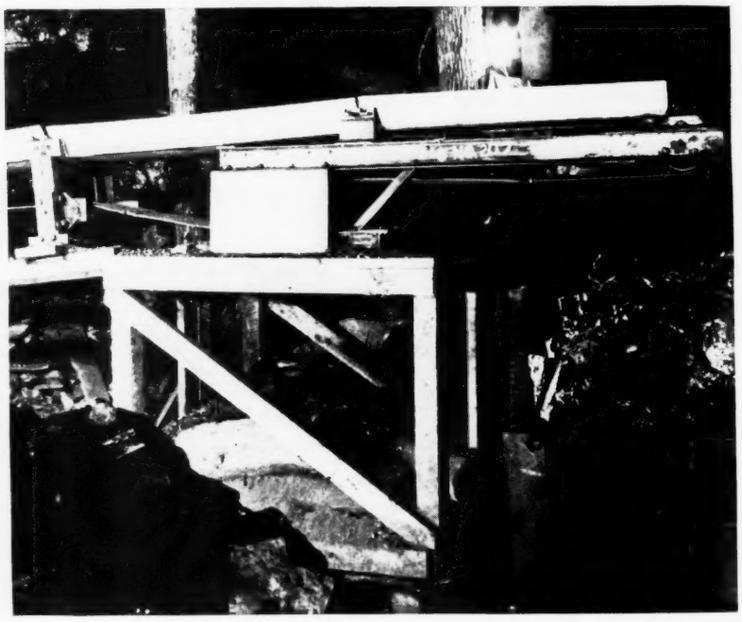
When the belt is tightened by the 30-in. take-up screws at the tail end, the pans act as a strut, making it unnecessary to fasten down either head or tail end. The drive head is set on a portable stand which is built in two sections and is just the proper height for the loading of mine cars. The conveyors are light, and in 2 hours three men can readily install them.

Belts are used also in sections *D* and *E*, where the floor is very uneven. In addition to conveying coal from dip places up to the car, they will readily transport the wet slush from the crosscuts, which can either be loaded into mine cars or taken off at any convenient point along the belt for gobbing. This can be done by taking out a pan and inserting a strut to keep the remaining pans in place and then placing a board diagonally across on top of the belt to act as a scraper at the opening where the pan has been removed.

A number of the counters have been driven with the aid of these belts. In this case the drive head and the first 30 ft. of conveyor are mounted over the track high enough for cars to be pushed under them. This allows three mine cars to be placed under the conveyor. Inby from this point, the conveyor dips to the floor, and the counter is advanced 250 ft. before the belt is moved inby for another set-up.

In addition to the belts with tandem-pulley drives and 5-hp. motors, just described, some units with single-pulley belt heads are used for distances up to 100 ft. These short belts also are used in some of the other beds for driving crosscuts. A few are equipped with small air motors for use in gassy headings ahead of the ventilating current. In section *C* where gradients are favorable and there is no slush, shaker conveyors are used with the same mining methods.

No. 14 Colliery is owned by the Pennsylvania Coal Co. and was formerly operated by the Pittston Co. It was idle from 1931 until early in 1937, when it was leased by William S. Jermyn and Edward M. Green.



A 12-in. belt discharging coal from a dipping place into mine car. Belt head mounted on portable table.

Side view of No. 14 Colliery breaker of Jermyn-Green Coal Co.

CINCINNATI CONVENTION

Smashes All Attendance Records

As Interest in Cost-Cutting Methods Swells

ATTENDANCE RECORDS were shattered at the American Mining Congress 17th Annual Coal Convention and Exposition, Cincinnati, Ohio, April 29-May 3, by operators eager to see the latest in cost-cutting equipment and discuss common problems with brother coal men. Total registration for the five days was 5,066; registration for the coal group was 2,782. Nine technical sessions covering face preparation, applied science, surface preparation, mechanical loading, maintenance, national economic problems, safety and stripping were held. Devoting an entire session to stripping was an innovation.

If the industry is to survive, declared R. L. Ireland Jr., president, Hanna Coal Co., and chairman of the Coal Division, it must continually press forward. The convention gives a forum for a quick review of the difficulties facing coal and how they may best be met. With a long way to go, the equipment manufacturer offers the only opportunity to retool the industry.

The manufacturer, said Frank E. Mueller, vice-president, Roberts & Schaefer Co., and chairman of the Manufacturers' Division, supplements the operator in the effort to make the coal industry profitable. An army of coal men, members of the various convention committees, remarked Julian D. Conover, secretary, American Mining Congress, had taken part in the development of the program. And the officers of the congress, added Harry M. Moses, president, H. C. Frick Coke Co., and national chairman of the program committee, had rendered yeoman assistance. Cheaper coal, stated J. F. Callbreath, secretary emeritus of the congress, means cheaper power and the improvement in production methods fostered by the congress should be a great contribution to the national well-being.

What the industry needs is an armistice and conference to try to understand one another's needs and replace competition by cooperation, asserted E. C. Payne, consulting engineer, Consolidation Coal Co., New York. Many sizes and grades of coal are being thrown away because the producer has not shown the consumer how he can manage to use them. No effort is made to change equipment to suit the coal; instead, the operator is asked to clean and size to meet the limitations of certain equipment.

A widening range of applicability in such equipment, continued Mr. Payne, would make possible a wider use of all available coals. New plants and old plants modernized should be fitted to the coals most readily produced. Resultant slacks are a great problem. A cooperative industry campaign to advertise the merits of such coals would be advantageous. Such campaigns would help public understanding of the basic problems of the industry and should be continued regardless of the ultimate fate of government price-fixing.

Utilization and distribution, remarked J. E. Tobey, fuel engineer, Appalachian Coals, Inc., are not as effectively handled as production. Coal should be sold up, not down—sold on its good qualities, not on its price. As there is only a little good coal, it should sell at a premium. When an oil man inspects a plant, he usually recommends certain changes which, if made, increases efficiency. Oil gets the credit, whereas with the same changes coal would have given equal or greater efficiency. Equipment for burning domestic sizes still leaves much to be desired. Coal men, however, should beware of attaching themselves to some new burning device until demonstrated by experience or

Cincinnati Ringmasters

Ernest B. Agee, superintendent, Youngstown Mines Corporation, Dehue, W. Va., was chairman at the opening technical session of the 17th Annual Coal Convention and Exposition of the American Mining Congress at Cincinnati, April 29-May 3. Chairmen of the other sessions were:

H. L. Richardson, vice-president, West Kentucky Coal Co., Sturgis, Ky., Monday afternoon.

Byron M. Bird, chief concentration engineer, Battelle Memorial Institute, Columbus, Ohio, Tuesday morning.

Robert G. Pfahler, mining engineer, Berwind-White Coal Mining Co., Windber, Pa., Tuesday afternoon.

P. L. Donie, vice-president, Little Betty Mining Corporation, Linton, Wednesday morning.

C. J. Sandoe, vice-president, Perry Coal Co., St. Louis, Mo., Wednesday afternoon.

K. R. Bixby, general manager, Midland Electric Coal Corporation, Farmington, Ill., Wednesday afternoon (round table stripping session).

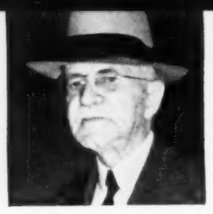
R. E. Snoberger, president, Binkley Coal Co., Inc., Indianapolis, Ind., Thursday morning.

I. N. Bayless, general manager, Union Pacific Coal Co., Rock Springs, Wyo., Thursday afternoon.

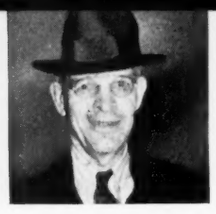
J. L. Davidson | Wm. Lesser | C. C. Conway | G. H. Esser | A. L. Toenges | J. G. Crawford

D. L. McElroy

R. H. Morris



J. F. Callbreath



W. S. Harris

R. L. Ireland, Jr.

R. V. Clay

studied by some competent research organization.

Voting is not all of citizenship, said Mr. Conover. The industry should let the lawmakers know what it thinks of proposed legislation. Coal is the only major industry under government control. While some believe the Guffey-Vinson act should have a fair trial, others insist that price regulation flies in the face of history and must fail. With fixed minimum prices, they contend, it would be impossible to keep all sizes in circulation. Bureaucracies move too slowly to make needed revisions in time to meet crises in production and marketing. Minimum prices, say opponents of the act, will encourage the opening of new mines.

The Neely federal mine-inspection bill, asserted Mr. Conover, contemplates a surplus policing agency which will not reduce accidents. It is stretching the constitutional power of Congress over interstate commerce to make it refer to the operation of a coal mine. Reciprocal trade agreements are a menace to the industry. The Venezuelan oil import tax has been lowered from 21 to 10½¢ per barrel. While this reduction applies only to the first 60,000,000 bbl., that importation will displace 15,000,000 tons of coal and 15,000 miners.

Construction of the proposed St. Lawrence waterway, he continued, would open our 15,000,000-ton market in Canada to foreign fuel. It would deprive sailors on the Great Lakes of jobs and divert business from railroads that burn our coal. Iron ore would come in from abroad and that, too, would affect the use of coal. Hydro-electric power from the St. Lawrence also would displace coal. In fact, proponents of the agreement to make this construction possible no longer think in terms of commerce, a waterway for the Western farmer or an extension of industry, but in terms of kilowatts to be generated by hydro-electric power. What it would do to American industry and labor seems not to enter the picture.

Taxes also are a major consideration. With an industry paying 60 to 66 per cent of its production cost to labor, its Social Security taxes, to say nothing of others, are extremely high, added Mr. Conover.

For every ton of zinc, ten tons of material must be handled, asserted H. I. Young, president, American Mining Congress, and from 2½ to 3 tons of coal is used in the reduction of that zinc. Railroads hauling the material also consume coal. For these reasons, coal men should be interested in the fate of zinc (the import duty on which has been decreased 35 per cent) and other materials whose protection has been reduced.

Because direct labor charges are such an important item, attention to personnel is more imperative in coal than in many other industries, declared H. R. Wheeler, industrial relations manager, Pittsburgh Coal Co. Despite the influence of natural conditions, the superiority one operation holds over another is largely due to personnel management. Training those already employed and inducting new men into the industry should be the principal objectives of such management.

Pittsburgh Coal, he continued, already has entered this long-neglected field by establishing two engineering scholarships, making loans to students and providing them with summer employment. These students will have completed several of the requirements of an eight-point mine-training program of the company by the time they finish college. The company also is assisting men studying to pass the more stringent requirements now imposed on underground officials by Pennsylvania.

Mechanical mining has created a shortage of maintenance technicians and machine operators which Pennsylvania State College is now endeavoring to overcome by a course of practical education. Stressing the field for specific job training, Mr. Wheeler cited variations of as much as 800 per cent in the time taken by different workmen doing practically identical posting jobs. Both employer and employee benefit when the men themselves are helped to get proper training for the job.

Generally speaking, remarked Prof. H. E. Nold, Ohio State University, the coal industry is still backward in training young men. The fact that coal does its student recruiting in May or June while other industries canvass the engineering schools in February gives the impression that opportunities are lacking in coal mining. There is a shortage of graduate mining engineers instead of a shortage of jobs, said D. L. McElroy, director, West Virginia University mining school. He, too, urged executives to select their men from the engineering schools much earlier than is common—in some instances, a man is asked to report within two or three days. Last year between 2,000 and 2,200 men were enrolled in the West Virginia University extension classes where preventive maintenance of loading machines is now being taught.

Demand for college graduates in coal mining is increasing, said Newell G. Alford, chairman, A.I.M.E. Coal Division committee on student interests. This committee, composed of twelve coal industry executives, is working to secure the underwriting of coal-mining student scholarships and summer employment for young undergraduates with mining companies.

Sitting for Coal Age Hall of Fame

Front, center, G. H. Rupp; rear, Floyd R. Pool

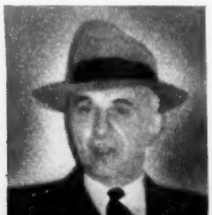
G. B. Harrington

Eugene McAuliffe

F. F. Jorgensen

J. D. Conover

E. B. Agee



Wm. R. Chedsey

T. J. Thomas

T. J. Stroup

W. C. McCulloch

Harry S. Gay

Albert Gately

John E. Jones

Ten per cent maximum power loss in distribution is considered ideal, declared K. L. Konnerth, electrical engineer, H. C. Frick Coke Co. When that is indicated from periodic power surveys of graphic charts from substation meters and meters taken to the face, bonding is assumed to be in good condition. Inside equipment usually takes 45 to 65 per cent of the total mine power and is responsible for 60 to 75 per cent of the total maximum demand. Direct-current equipment consumes 1.9 to 4.5 kw.-hr. per ton, depending on rate of production and physical conditions. As much territory as possible is tied into one electrical system to take full advantage of the diversity factor. Individual mine sections are fed through automatic-reclosing breakers on the take-offs from the substation buses.

Mr. Konnerth advised against concentrating d.c. generating capacity in large substations. With present load concentrations in the larger mines, upper limits of 150 to 300 kw. for 250-volt power supply and 300 to 600 kw. for 500-volt supply were suggested. A successful distribution system should embody flexibility to meet changing load requirements, proper degree of continuity of service, no excessive voltage variations, losses held within economic permissibility and no undue hazards. From the standpoint of first cost, reliability and cost of maintenance, the three general types of conversion units now in use are practically on a par. Rectifiers, in his opinion, have high operating efficiency, especially at low load and high momentary overload capacity, but lack flexibility in voltage and power-factor adjustments during operation.

High efficiency at low loads is of outstanding importance in selecting substation equipment, maintained James Lively, West Virginia Engineering Co., Charleston, W. Va. While indorsing the 10 per cent maximum loss, the smaller mines, he said, seldom can afford such a standard or a complete outlay of electrical instruments for making periodic power surveys. A cheaper method of underground substation installation to permit more frequent movings is badly needed.

While $200 may be saved on the power bill with demand limiting, argued A. Lee Barrett, electrical engineer, Pittsburgh Coal Co., several times that amount may be lost in extra labor cost. For motor-generator sets and with proper copper in the mines, he advocated a flat or drooping voltage characteristic. To limit undesirable overload transfers from one interconnected substation to another he suggested the overload-controlled sectionalizing breaker at the neutral point or voltage-controlled breakers closer to the substations. Judging from reports of underground distribution cable flashes, lightning arresters may be needed on underground cables to protect against local surges rather than against lightning.

Table I—Power Characteristics at Some Frick Plants

System Number	Number and Type of Generating Units	Total Generating Capacity Kw.	D.c. Connected Load Underground Hp.	Length of Interconnecting Bus Feet
1	5 m.-g. sets	2,950	12,500	40,000
2	5 m.-g. sets	2,100	11,500	28,000
3	8 rotaries 3 m.-g. sets	2,300	6,500	65,000

Mr. Barrett also suggested that more consideration be given to the possibility of using alternating current underground. Such use would effect power savings through lower voltages for certain jobs, lower maintenance costs, better heat-transfer characteristics on inclosed motors and greater portability of transformer substations. The a.c. series motor, he pointed out, would do the job for drilling, cutting and some other operations. With direct current, headlights on a 500-volt locomotive alone can be responsible for a $10 monthly power cost.

Establishing test sections to work out yardsticks for timbering costs per foot of heading for the several typical general conditions encountered in a mine was advocated by Frank G. Smith, general superintendent, Sunday Creek Coal Co., Nelsonville, Ohio. Each test section should be at least 1,000 ft. Too often the type of roof support merely follows prevailing district practice instead of a study of the material to be supported, life expectancy of the heading and types of materials which could be used. Cost over the life of the job is the most important consideration and it may be better to spend some on upkeep rather than too much on the original installation.

Better Face Preparation

HOW TO IMPROVE face preparation was the theme of the opening session of the convention on April 29. A better "drilling pattern" for position, depth, direction and order of drillholes in the firing of shots, answered J. W. Anstead, electrical engineer, Templeton Coal Co., Sullivan, Ind. "Floating shots," said James M. Godwin, chief mine inspector, Pocahontas Land Corporation, Bluefield, W. Va., while J. T. Parker, superintendent, Inland Steel Co., Wheelwright, Ky., emphasized systematic mine timbering.

Other means of improvement, added Mr. Anstead, include education of shotfirers, cushioning of shots and giving the day-shift face boss control over the night boss to effect complete coordination between the work of both shifts. In cushioning, 1¾-in. cartridges are laid in a 2-in. hole, with a space 12 in. long left at one end of the hole to permit expansion of the explosive gases. This reduces the violence of the shot and the burden on the coal is spread over a greater proportion of the length of the hole to avoid the possibility that coal at the back of the cut will be shot down while the front end is left unaffected. The dummy nearest the cartridges is not tamped, the next only lightly tamped, and the other dummies to the mouth of the hole are tamped hard.

Radial drilling from the machine head expedites making drillholes, but better work is done when holes are driven parallel to the advance. Mr. Anstead favored holes 12 in. shorter than the undercut is deep. Face preparation, said E. B. Agee, superintendent, Youngstown Mines Corporation, Dehue, W. Va., is the most difficult problem in mechanical loading.

Bits tipped with Borod can be used a second time without heating if sharpened with emery. Bit life is increased 139 per cent in this manner at Inland mines, stated Mr. Parker, in describing hand-loading mining in 45-in. Elkhorn No. 3 coal. The roof is a dangerous slate with frequent treacherous kettle bottoms. Standard timbering not only promotes safety but standardizes and simplifies the miner's work. With timbering systems planned in advance, there is less friction between bosses and men, since the latter do not have to be told where to stand their posts.

If the roof is bad, however, the boss may demand that more posts be set, for

S. W. Blakeslee

R. L. Adams

S. S. Lanier, Jr.

Paul Halbersleben

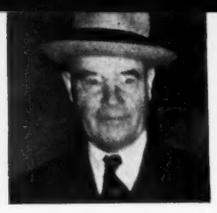
L. N. Thomas

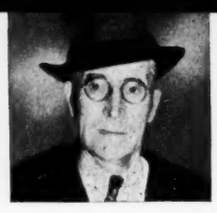
Carl McFarlin

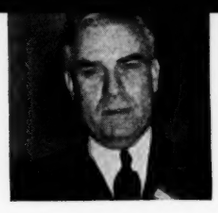
R. E. Salvati

L. A. Miller

John Lyons


J. E. Butler


J. A. Welch


L. C. Campbell

the rules only say the number ordered will be the least that will be required. Inland Steel, continued Mr. Parker, has two standards, one for sand-rock and one for slate roof. The standards may require some unnecessary timbering, but provide a safety margin in case some unforeseen weakness exists. Up to 1939, steel jacks had been used only in a supplementary manner. Last year, however, standards were changed to provide that such jacks be used in all working places except pillars.

Steel posts can be set in 30 to 40 seconds. Men will place them where they could not readily be induced to set wood posts, which take from one to four minutes. During the five-year period 1934-38, roof-fall accidents averaged 16.8 per year; in 1939, there were 13 such accidents—a reduction of 22 per cent. Fatalities averaged 1.8 per year from 1934 to 1938; last year there were none. Steel posts are used merely as temporary protection. Wood is placed as the steel is removed so that the roof support at all points 8 ft. or more from the face is wooden posts.

The steel posts, explained Mr. Parker, have an ultimate sustaining strength of 7 tons. No steel jacks are used at Wheelwright in depillaring operations. Pillars are robbed on the retreat, not from the boundary, which is too far distant, but from a more conveniently located barrier pillar. Rooms are 300 ft. long; length of room headings may vary from 600 to 1,600 ft.

"Floating shots" were defined by Mr. Godwin as cartridges set with fiber rings around them so that the string of explosive is kept free from the periphery of the borehole in all directions. The first cartridge, which contains the detonators, is pushed into the end of the hole and drawn out again 4 to 10 in., leaving a space that length beyond the charge. Then the other fiber-ringed cartridges are pushed in gently. After the cartridges are in place, clay material is put in to occupy about half the cross-section of the hole. This tamping, which is termed a "loose dummy," is never rammed. The stemming is then put in the hole by degrees and tamped as inserted until it reaches the mouth of the hole. The drillhole has a diameter ¼ in. larger than the cartridge it is to house.

Such shots, asserted Mr. Godwin, can be loaded as quickly as ordinary shots and are safer. The hole is better balanced, for the pressure of the gases of explosion on the periphery of the hole extends to a point much nearer the mouth of the drilling than if no space were left before and behind the explosive. A better springing, spreading and heaving action results. Less explosive is used. Shattering and pulverizing are eliminated and there is a large increase in coarse sizes. Roof is less damaged and, if the shot is overcharged, coal and roof are less severely affected than with non-floating shots.

Mr. Godwin showed the system of firing with (1) a "snubber" (relief) shot entering the coal to one side at an angle and not extending to the back of the cut, (2) another shot entering the face at right angles and about equally far from the center as the relief shot and (3) and (4) two rib shots. The firing order is 1, 3, 2 and 4. When all four shots have been fired and all the coal is down, the machine is brought in and the coal loaded out.

Rock dust, said Mr. Godwin, was an undesirable tamping material, but Eugene McAuliffe, president, Union Pacific Coal Co., declared he used it exclusively with most satisfactory results. Mr. McAuliffe also questioned whether the floating shot was as safe as one solidly tamped. Undercuts, stated Mr. Godwin, were often 9 ft. deep, but the holes never exceeded 7 ft. If the coal is not brought down with the first shots, little pop shots can be put in the overhang. But work around such a shattered overhang, protested some delegates, was dangerous and pop shots themselves were frowned upon by safety men.

Cutting Loading Costs

MECHANICAL MINING again dominated the Cincinnati convention. In addition to two sessions on actual machine operation, progress in accident reduction under mechanical loading was highlighted in the session on safety, the subject also entered the discussions on face preparation and the maintenance session drew upon the experiences of mechanized deep mines and stripping operations for its material. Safety, face preparation and maintenance are reviewed in other sections of this report (see pp. 62, 57 and 60).

With more than 80 per cent of the daily output changed from hand loading to duckbills, over-all costs have been cut 20 per cent at Seco No. 1 mine, South Eastern Coal Co., Seco, Ky., stated V. D. Picklesimer, general superintendent. Supply and power costs went up 25 per cent, but total mine costs dropped 30 per cent. There was an increase of 8 per cent in minus 2-in. coal and decreases of 6 and 2 per cent, respectively, in 5-in. block and egg. Part of this decrease was due to a change from pellet to permissible powder and the fact that one-half the mechanical mining equipment works in barrier pillars.

Seco is mining the No. 3 Elkhorn seam, averaging 54 in., with slate roof and fireclay bottom. A rash parting ranging from almost nothing to 2 in. tops 32 in. of hard splint; above is a softer gas coal. Under hand loading, softness of the fireclay necessitated use of board platforms in cutting and loading. Top varies from zero to 40 ft. Except in a few cases where a thin layer of slate comes down with the coal, there is free separation from the top. Main sandstone top has cracks extending in places through the slate, so, on the whole, the top is unpredictable.

Eight Goodman shaking conveyors with G-20 drives and A-3 duckbills were installed in pairs between Sept. 5 and Dec. 16, 1939. Existing small-capacity mine cars were retained. Two conveyors are used per section, both discharging at a common point into one mine car. Eight men and a foreman constitute a crew. Rooms are driven 30 ft. wide and 270 ft. deep at right angles to the entries. Thin pillars are left between rooms; on the first rooms, which are driven next to the outcrop, most of the pillars were mined as the equipment was brought back out of the room.

Taken as a whole, continued Mr. Picklesimer, renewal-parts costs on conveyors have been very reasonable. Major breakdowns, which might have cut production materially, have been eliminated by changes in design and by regular inspection and adjustment of electrical and mechanical equipment. A complete system of records on production, maintenance and supplies is indispensable for efficient operation. As foremen and crew became better trained, production per man rose.

Don't buy coal-loading machinery unless determined to make it work, advised Eugene McAuliffe, president, Union Pacific Coal Co. Last year his company recovered about 2,500,000 tons—over 75 per cent of its total output—from pitching seams with duckbills. His company has

K. R. Bixby

S. F. McGurk

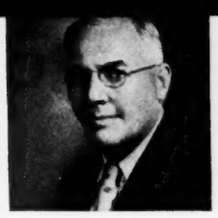
J. S. Forman

Jim Hyslop

Byron M. Bird

Joe Pursglove, Jr.

P. L. Donie



W. J. Wolf

B. H. Schull

C. E. Williams

N. G. Alford

Bert Simonson

1,555 in use and had only 27 lost-time accidents in 1939. Recovery is 90 per cent by driving 21-ft. rooms up the pitch and bringing back a pillar. The pay system includes a bonus but no penalties. All the duckbills work in pitching seams. Although there is no mechanical cleaning, impurities are so well controlled that locomotives using the coal can operate 2,000 miles without cleaning fires.

At the Buckhorn mine, in southern Illinois, said G. S. Jenkins, assistant general manager, Consolidated Coal Co., St. Louis, Mo., flight room conveyors relay the coal from loader to mother belt; main haulage is handled with one man taking trips of four cars each. These are drop-bottom cars approximately 7 ft. wide by 22 ft. long and carry 11 tons each. They dump underground and the coal moves out on a slope belt. At present, the four loading units average 1,600 tons per day and hit peaks of 2,200 tons.

Panels are worked by advancing with three rooms up one side and then retreating along the other. Rooms are 25 to 28 ft. wide on 50-ft. centers and 300 ft. deep. Often a set of three rooms is worked out in a week. One mother belt can take the surges from three loading machines. Gaps between car-body ends on trips are closed by inverted V deflectors so that the mother belt is not stopped during car spotting. A rubber-tired storage-battery transfer truck is used for moving heavy parts not carried on the caterpillar transfer trucks of the short-wall cutters. Degradation with this flight-belt-and-car-haulage system is no greater than in the typical mechanical mine where cars serve the loading machine direct.

Two-conveyor syndicates—i.e., not more than two room conveyors discharging to one mother conveyor—with a wage-incentive plan was pronounced the best system by W. J. B. Mayo, in charge of conveyor mining, Koppers Coal Co. Success in the operation of multiple units involves proper projection in relation to natural conditions, selection of suitable equipment, job analysis, and true leadership and planning. Production per man drops when there are more than two conveyors in a syndicate, observed Mr. Mayo; the tendency is for the faster units to fall to the pace of the slowest.

C. R. Stahl, general superintendent, Powellton division, Koppers Coal Co., said he had the best results with two conveyors delivering to one loading point and paying the syndicate by the ton. Although accidents have decreased with conveyor mining, the increased dust and greater gas emission with more rapid mining must be watched. His company finds spraying the coal at the conveyor discharge quite successful. About three quarts of spray is used per ton; the water contains an activating agent mixed about 1 part to 100.

Pennsylvania division mines of Consolidation Coal Co., said L. H. Schnerr, division manager, have been using conveyors for 13 years. The single-room set-up is now standard because it is safest and best. Over 600,000 tons has been produced with this set-up, recovering 32 in. of a 34-in. seam without a fatality at the face. Two- to four-room set-ups and pay by tonnage rate was advocated by E. B. Gellatly, Jeffrey Manufacturing Co. It is not hard to get sixteen men to split the check, but, with a tonnage rate, operation of eight to ten units is difficult. Securing efficiency on day rates is a matter of supervision.

Secondary haulage is in the process of revolutionary change with the advent of the shuttle car, declared H. B. Husband, general manager, fuel mine operations, Chesapeake & Ohio Ry. Those who intend to introduce shuttle cars must anticipate breakdowns and prepare for them because continuous operation is a *sine qua non* of success, asserted Harry S. Gay, vice-president and general manager, Gay Coal & Coke Co., Mount Gay, W. Va. A card system should be maintained to record breakdowns.

Questioned as to the safety of this form of transportation, Mr. Gay replied that, when the roads become boggy from water and long use, the line of travel readily can be changed. Trouble might be anticipated if a road is used continuously, as where rooms are extended for 300 ft. Coal-dust dangers can be more readily overcome than boggy bottom, since rock-dusting will check the dust hazard. He had seen no evidence of any degradation and did not think it occurred, for the fall is less from conveyor to car body with the shuttle than with the mine car and the coal falls on other coal already loaded.

Operators, said R. L. Adams, general superintendent, Old Ben Coal Corporation, West Frankfort, Ill., rarely have an opportunity to select the full range of equipment for their mines and so have to consider not only the physical limitations of the seam itself and mine layout but also those of other equipment already installed. In September, 1928, when the right to install mechanical devices became a part of the union contract, operators had to endeavor as best they knew how to fit the new mechanisms to the old. Slowly the new loading units made other new units for adjuvant purposes necessary, but never was the outcome as well devised as it would have been had the work "started from scratch."

Excessive speed, continued Mr. Adams, is neither safe nor economical. The most satisfactory speed for track loaders is 3.2 m.p.h., with a low speed of 70 ft. per minute. Experience with loaders equipped for 100 ft. per minute and those designed for 57 ft. in low gear shows much less wear on tracks and tramming clutch with the latter. Too much speed puts overmuch strain on the men, causing fatal accidents and derailments without any consistent increase in tonnage. Men cannot keep up for any distance with a loading machine traveling 5 m.p.h. Gathering locomotives also should not travel more than 3.5 m.p.h.; while loading, the cable should be unreeled so that opportunity will be given for dissipation of heat. Equipment should be constructed to afford ready accessibility to all troublesome spots.

Superior Coal Co., said F. S. Pfahler, president, speaking on behalf of D. D. Wilcox, general superintendent, uses 34 track-mounted loading machines at its four Illinois mines. There are fourteen track-mounted cutting machines, with three double-shifted, so that each cutter serves two loading machines. Last year, upkeep cost for lubrication, repairs and labor on the loaders was 3.31c. per ton. The cutting machine is the fundamental unit: what it can do determines the performance and number of the loading units.

It generally has been taken for granted outside of western Pennsylvania and northern West Virginia that pillars cannot be recovered with mobile loaders. Examples at Wildwood (Butler Consolidated Coal Co.), Renton No. 3 (Union Collieries Co.) and Springdale (Allegheny-Pittsburgh Coal Co.), however, show that it can be done successfully and economically, said J. M. Connor, general superintendent, West Penn Power Co.

All rooms and entries at Wildwood are driven on an angle to each other of 62 deg. 45 min. and the line of break runs 58 deg. 30 min. to the entries. Renton and Springdale pillars are rectangular; in recovering them, mining is started on the short inby side of the pillar with the first cut at the inby edge of the long side of the block. Cuts are made progressively toward the breakline. By starting on the short side, the distance to the breakline is shortened so that the men can get in and out of a place faster should trouble develop.

At Springdale, when this work is half completed (four cuts out of nine), another series of cuts is started along the long side of the block at the end away from the breakline and extended 7½ cuts

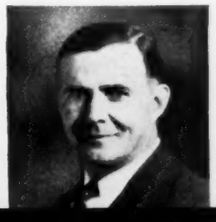
W. C. Thompson

Wm. Whelan

H. A. Reid

C. J. Sandoe

G. S. Jenkins



W. J. Jenkins

W. L. Affelder

H. G. Conrad

M. D. Cooper

G. D. Cowin

H. N. Eavenson

J. R. Foster

until it meets the short-side series. When this is nearly finished, a second series across the short side follows, 6½ cuts being taken, and this has advanced only one cut when a second series of 6½ cuts along the long side is started. Four cuts along the short side and three along the long are made, leaving only two cuts on the short side and less than a cut on the long side. Each block is 75 to 85 ft. Small triangular blocks of coal are left along the goaf and even these frequently are recovered. Rooms are not driven up until needed, leaving until that time a virgin triangular pillar with one corner reaching almost up to the breakline. This does much to enhance stability. Where the coal has over 500 ft. of cover, the system must be scrupulously followed.

Buyer-Satisfaction Pays

INVESTMENT in a cleaning plant may present greater profit-making opportunities than expenditure for any other type of equipment, declared J. P. Horne, general superintendent, Raven Red Ash Coal Co., Red Ash, Va., at the session on surface preparation. Even if his coal is selling above production cost, the operator should explore the possibilities of higher realization through better preparation. Retailers judge quality by visible impurities and will be happy with 7 per cent inherent ash, but vigorously object to a 4-per-cent-ash coal if 1 per cent is in the form of visible impurities. Mechanical cleaning will save time and expense in settling complaints and in giving rebates for poor preparation.

Where all sizes need cleaning and it is impossible to finance an installation large enough to handle the entire mine output, installation of a unit at a time, beginning with the size or sizes which need cleaning the most, is the sensible plan. If the tonnage of this size is insufficient to justify cleaning by itself, then the next two sizes which have been selling well can be cleaned with this size in a single unit, thereby making a first-class product of all three. Oil treatment before washing will cause coal to absorb less moisture; re-treatment with oil after washing helps protect the coal against freezing.

The small operator is under as much obligation to sell clean coal as the big producer, asserted A. E. Marriott, Marriott Reed Coal Co., Columbus, Mo. Last year he produced 14,000 tons of block from a strip mine with a slack yield of three to five tons daily. Installing a small washing table at a cost of $1,000 created a ready market for the cleaned slack and netted a handsome profit. Uniformity and continuity of product are paramount in cleaning, observed W. C. McCulloch, preparation manager, United Electric Coal Cos., Duquoin, Ill.; without an even product, success cannot be attained. Small operators, remarked Byron M. Bird, chief concentration engineer, Battelle Memorial Institute, should remember that reliable screen analyses and float-and-sink tests are needed by the manufacturer who is to provide even the smallest cleaning units.

Average realization for a month at the pyrite plant of Pittsburg & Midway Coal Co. (*Coal Age*, March, 1940, p. 76) was $1.38 for coal recovered from the refuse and $2.38 per ton for pyrite, said K. A. Spencer, vice-president and general manager. An attempt to burn 1-mm. slurry that had been partially dried in drainage tanks and storage piles at Little Sister mine, Central States Collieries, St. David, Ill., stated H. N. Case, superintendent, failed because the fuel was too high in moisture and ash and the boilers could not meet peak loads. Later an Elmore continuous centrifuge handling a mixture of 35 per cent solids and 65 per cent water was installed. Solids averaged 30 per cent ash.

About 25 tons of solids and 45 tons of water are fed hourly to the centrifuge, which delivers 15 tons of processed slurry containing 11 per cent ash and 10 per cent surface moisture with a fuel value of 11,000 B.t.u. Centrifuge effluent averages about 55 per cent ash and is pumped to waste in a settling pond. Today one instead of two boilers handles the load at the preparation plant and one man working part time does the entire boiler job; formerly three worked full shift handling the ash.

A second centrifuge has been installed to handle $\frac{1}{16}$-in. x 1-mm. carbon; in this, 20 to 25 per cent of moisture is reduced to 4 per cent. Moisture elimination is so great that coal has been loaded at —18 deg. F. and hauled to market. No heat drying is required. Average drying costs, including power, supplies and labor, do not exceed 3c. per ton of coal handled.

Opinion seems crystallized that neither wet washing sizes finer than $\frac{3}{8}$- or $\frac{1}{4}$-in. nor dry cleaning coal larger than $\frac{1}{2}$- or possibly $\frac{3}{4}$-in. is profitable. Because of moisture, maintained Joseph Pursglove Jr., general manager, Pursglove Coal Mining Co., Pursglove, W. Va., wet-washed coal under $\frac{1}{4}$-in. cannot be marketed economically. Heat drying, sometimes coupled with centrifuging, is needed and the water must be clarified if it is to be conserved and fine coal particles recovered. This demands sludge pumps, thickeners and frequently large and costly vacuum filters. Combination plants, therefore, are favored in the Appalachian area.

Practice in the Rocky Mountain region was illustrated on the screen by W. N. Wetzel, general superintendent, United States Fuel Co., Hiawatha, Utah, reading a paper by C. S. Westerberg, preparation engineer, Utah Fuel Co., Castle Gate, Utah. This covered all the more modern Western preparation plants and particularly the new one at Castle Gate (*Coal Age*, June, 1940, p 41).

Goodby to Breakdowns

WRITTEN REPORTS covering inspections, operating conditions and repairs are fundamental in adequate maintenance, declared Charles R. Nailler, engineering assistant to the superintendent, Hanna Coal Co., St. Clairsville, Ohio, in sounding the keynote of the convention session on maintenance problems. The man in direct charge of maintenance must be production-minded and be kept informed of the production aims. Proper use of personnel will determine the success of the whole maintenance system, but the production department also must insist upon proper operation of the equipment.

Van B. Stith

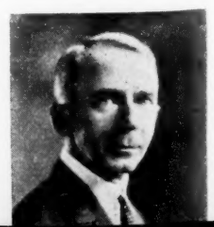
C. E. Lawall

Glenn A. Knox

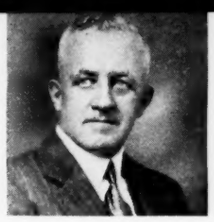
H. P. Smith

W. L. Robison

David Ingle



A. W. Hesse



J. B. Morrow

D. H. Pape

D. A. Thomas

Rice Miller

John H. Jones

Inspection forms serving as control for maintenance at Willow Grove No. 10 mine divide the machine into units because different parts have definite life characteristics. Principal items of maintenance are covered by instruction manuals. Rebuilding is kept separate from routine maintenance. Maintenance men handle practically all lubrication and use a special car fitted with every convenience for quick, efficient work, said Mr. Nailler. Blackboards at headquarters show the location of each item of equipment and are used for supervising, dispatching and checking maintenance.

Lubrication at Willow Grove is on a two-shift basis. Each loading machine is thoroughly lubricated every two days and a crew is able to lubricate seven machines in seven hours. Cutters receive no lubrication except that given by the lubrication crew. Sealed guns to lubricate certain parts of the Myers-Whaley loaders are charged with grease from a pressure pump on the lubrication car. Locomotives are lubricated only during weekly inspections.

Local conditions may be the deciding factor in determining whether it is best to have a maintenance man in the section or rely on men dispatched from the central shop. With the better machinery now available, the need for a man on the section is less. One mine now working with central-shop face maintenance has a slightly lower delay record than one with a man kept on the section. Where properly selected, new maintenance men usually can be adequately trained in six months. The percentage of college graduates who will remain in maintenance work is small.

Close to 70,000 tons per preventable breakdown has been attained at the 1,100-ton-per-day full-mechanical mine of New Castle Coal in Alabama, said Carr McCormack, Jr., engineer's assistant. Two 8BU Joy loaders work double shift, but dumping is done only on one shift. Hoisting is by rope haulage on an 1,800-ft. slope. Daily operators' reports and detailed weekly inspection reports are basis of the maintenance plan. When study of these records shows that a certain machine part is near the end of its life, a reconditioned part is put in its place.

At Midland Electric Coal Corporation mine, Farmington, Ill., explained W. W. Youngblood, superintendent, a 100-ft. coordinate map is posted daily to show by planimeter measurements the yardage of overburden moved and coal uncovered. Daily maintenance and performance records of each shovel also are kept. Time-study recording instruments, which are being adopted quite generally on strip shovels, now record degrees of swing against time. Men on the job learn to read from the lines on the chart a complete story of the shovel performance and can see at a glance whether proper methods of digging and casting have been followed.

Mr. Youngblood showed slides of two strip shovels working in tandem—a method, he said, coming into favor. Ahead works a short-range shovel with short boom and sticks and large dipper. Immediately behind it is the long-range shovel with long boom and sticks and smaller bucket. Each shovel is more efficiently suited to the particular range of work it handles. The arrangement also is advantageous in opening a box cut in badly sloughing material. A box cut in 50-ft. overburden readily has been made by this method.

Separate maintenance-cost records for each piece of equipment were recommended by C. W. Woosley, general superintendent, Pyramid Coal Corporation, Pinckneyville, Ill. His company keeps performance cost records of the natural subdivision of a strip operation in considerable detail until experience proves certain items or an entire subhead may be safely dropped. In compiling the somewhat interwoven costs of drilling and shooting, symbols after the figures in the statements indicate many detail facts, such as the type of explosive used with that unit.

Preparation-cost records are broken down only where detail seems valuable. A separate record, for example, is kept on the costs of calcium-chloride and oil dustless treatment. The daily report of each truck driver hauling coal from pit to tipple includes tire changes, delays, etc., and all these are measured against miles and tons. Detailed records are made for each tire. High costs, added Mr. Woosley, may justify further splitting of truck costs into units such as motor and transmission.

How far functional costs should be broken down, asserted H. A. Reid, chief engineer, United Electric Coal Cos., Chicago, depends upon the magnitude of the function. At United Electric mines the four functions of overburden removal—drainage, drilling, blasting and stripping—are all checked against coal tonnage produced. Tonnage figures are calculated from actual surveys by the engineering department. Stripping costs are divided into several items, each weighed against cubic yards of overburden removed.

Innings for Stripping

CONSTRUCTION details of the new 35-yd. shovel at Tecumseh Coal Corporation, Boonville, Ind., automotive haulage from pits to cleaning plants, transmission-line cables and carry-all scrapers in overburden-removal work featured the round table on stripping at the Cincinnati convention. Methods of keeping detail cost records on strip-pit equipment were presented at the session devoted to maintenance problems (see p. 60).

The Tecumseh shovel, said Howard S. Richards, general manager, in a paper read by F. Janeway, chief electrician of the company, is the first knee-action front-end type to be installed at a stripping operation. Crawlers, the paper continued, swivel independently both longitudinally and transversely. Automatic leveling is controlled by an electric eye. Tramming power is furnished by two 425-hp. motors; each motor has its own hoisting generator. The dipper is steel-welded, with cast-manganese-steel lip and chrome-nickel-molybdenum teeth and bases.

Development of 80-ton trucks, explained L. Russell Kelce, vice-president, Hume-Sinclair Mining Co., Kansas City, Mo., is the outcome of the necessity for economical haulage. Each increase in truck size creates new automotive problems; additional changes may be necessary even after a truck has been put in service. Last July, for example, the 80-ton unit (*Coal Age*, August, 1939, p. 39) was redesigned to include a Waukesha engine and fluid drive.

To date, Mr. Kelce continued, 238,826 tons has been hauled by this unit at a cost of 3.453c. per ton. Tire cost was 10.8c. per mile. Total cost of a new unit is $22,000. Allowing five years for depreciation and estimating a haulage of 168,000 tons per year, total cost is 6.053c. per ton. To purchase the necessary four units will cost $88,000; using 20-ton trucks for the same service would cost $108,000 and still smaller units would be still more costly.

A. H. Crane

Evan G. Evans

Dan Harrington

J. C. Haddock

E. H. Graff

F. B. Dunbar

M. W. Crenshaw

J. T. Clark

H. H. Bubb

J. M. Johnson

W. P. Young

H. L. Gandy

Use of armored cable in place of pole lines for power transmission means a 5 per cent greater initial cost, stated C. E. May, chief engineer, Northern Illinois Coal Corporation, Wilmington, Ill. Over a period of years, however, the saving in material and labor alone is sufficient to make it preferable to pole lines. The 38,000 ft. now in use has eliminated all main-line poles and 52,000 ft. of laterals. Armored cable is readily adjustable, can be moved by team or tractor, may be taken from pit to pit, is stormproof and safe. Original cable installed twelve years ago is still in service.

Cable is added in 1,000-ft. lengths, explained J. C. Rettenmayer, chief electrician of the company, and is connected by junction boxes. These boxes are constructed to permit sectionalizing. To move from pit to pit, the cable is wound on a reel mounted on a truck. Four men can reel 5,000 ft. in a seven-hour shift.

How carryall scrapers are being used as auxiliary units for overburden removal was detailed by T. G. Gerow, chief electrician, Truax-Traer Coal Co., Chicago. Scrapers have been standard equipment at all Truax-Traer strip mines since 1936. They are useful for all types of earth-removal work, including road building, overburden, spoil banks, and ramps. At the St. David mine, 100,246 cu.yd. has been moved with hauls of 400 to 1,000 ft. An average of 52 cu.yd. per shift-hour has been moved at a cost of 3.6c. per yard. A cost of 2.88c. per cubic yard is obtained in drainage work.

Safety on the March

EVERY change in methods or equipment introduces new hazards in mining, but these can be eliminated or controlled through proper study and supervision. This thesis was emphasized and reiterated at the safety session of the Cincinnati convention. Leaders in mechanical mining, it was pointed out, had willingly accepted management's responsibility in this field and had effected a progressive improvement in the accident record of the industry.

True comparisons of safety under hand and mechanical loading, said L. F. Young, consulting engineer, cannot be made until the mine has had ample time to develop and install safety measures to combat the new hazards. Comparative data supplied by executives who have had several years' experience with mechanical mining all show a marked decrease in accident rates. These executives, he continued, believe still further improvement can be made by more attention to inspection and discipline, better and more intensive job training and by presenting to manufacturers the specific needs for building additional safety devices into their machinery. Manufacturers, he added, are very willing to build safer equipment.

Wherever possible, continued Dr. Young, continuous operation at the face should be the goal of future mining. The mining system must be improved to provide the safest methods. Instruments will be used at the face to warn of impending dangers, such as gas and possibly roof falls. Better face lighting must be achieved. Proper steps to localize fires and explosions must be taken. Improvement in ventilation and use of a continuous gas-detecting and alarm-giving device at the face can overcome the dangers inherent in rapid advance. Effective employment of known precautions against the hazards of point concentration will permit the industry to safely enjoy the advantages of such concentration. Wetting seems imperative for controlling dust in some mines; roadways must be cleaned in many others.

Adequate, and preferably excess, air delivered to the working faces was characterized by T. J. Thomas, president, Valier Coal Co. (Illinois), as the most important safety measure. Instructions call for shutting down the mine at Valier if at any time gas is discovered in any place and cannot be cleared before the men go in or shortly thereafter. Mr. Thomas was skeptical of an elaborate set of safety regulations and preferred to trust in a few rules adequately enforced. Sprinkling cars and roadways is an anti-dust precaution at Valier.

By practicing the safeguards urged by Dr. Young, greater safety can be achieved with mechanical mining than with hand loading, asserted L. C. Campbell, assistant to the vice-president, Koppers Coal Co. In three Koppers mines over periods of several years, tons per lost-time accident with hand loading and then with mechanical mining were respectively: mine A, 11,300 and 56,000 tons; mine B, 10,214 and 46,783; mine C, 34,946 and 65,988 tons.

Loading machines reduce the hazards at the point where they are most likely to occur—i.e., in the space between the operator and the face—stated L. A. Hill, assistant superintendent, Chicago, Wilmington & Franklin Coal Co., Orient, Ill. Stepping frequency rates for jobs from the face to the shaft bottom and outside means that the battle with nature becomes less and less outby of the face. Those are underlying reasons why, with proper precautions, mechanical loading can be made safer than hand loading.

In both Orient and New Orient, introduction of new methods forced management to introduce new precautions. The net result has been a great reduction in accidents compared to hand loading. Sufficient and uninterrupted ventilation, coupled with adequate rock-dusting (not below the 55-per-cent limit) are the best safeguards against explosions. Electric cap lamps and no-smoking rules, eliminating open flame at the face, also have helped. Statistics show that accidents rise as the noon hour approaches and reach a peak toward the end of the shift as fatigue increases and alertness possibly decreases.

Tabulate the man-made hazards and then remove them, advised John Lyons, safety engineer, Bell & Zoller Coal & Mining Co., Zeigler, Ill. Because of noise, tendency to leave greater space without supports and to knock out or move props after instead of before a machine enters the place, and vibration caused by the machine, man-made hazards are greatest with mechanical mining. But these can be eliminated if management is safety-conscious.

There is no valid reason why mechanical mining should be more hazardous than hand mining if accompanied by the changes that should go with it, in the opinion of J. T. Ryan, president, Mine Safety Appliances Co. The coal-dust hazard can be taken care of by water or the newer chemical solutions at the face or transfer points and by rock dust. More and better controlled ventilation is the first answer to the gas hazard.

Few, but emphatic, safety rules was the prescription offered by Charles E. Vawter, engineer, Gauley Mountain Coal Co., Ansted, W. Va., who also expressed concern over the dust hazard in mechanical mining. Mechanical-loading hazards, maintained C. A. Herbert, U. S. Bureau of Mines, Vincennes, Ind., are the same old hazards that have been known for many years, and "we know the answers." He called specific attention to the continuing wide use of black powder—nearly half of the explosives consumed. Despite approved machinery available, comparatively little of it is used at the face; worse yet, much of that is not maintained in approved condition.

Hugh Boyle

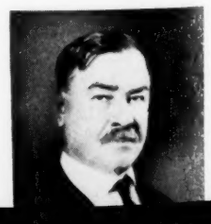
A. C. Dittrick

H. F. Hebley

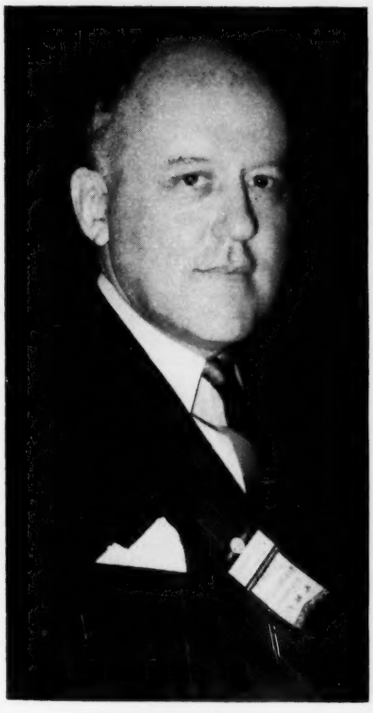
A. Lee Barrett

Robert Dickson

J. J. Rutledge



Profit Makers for Coal Mines

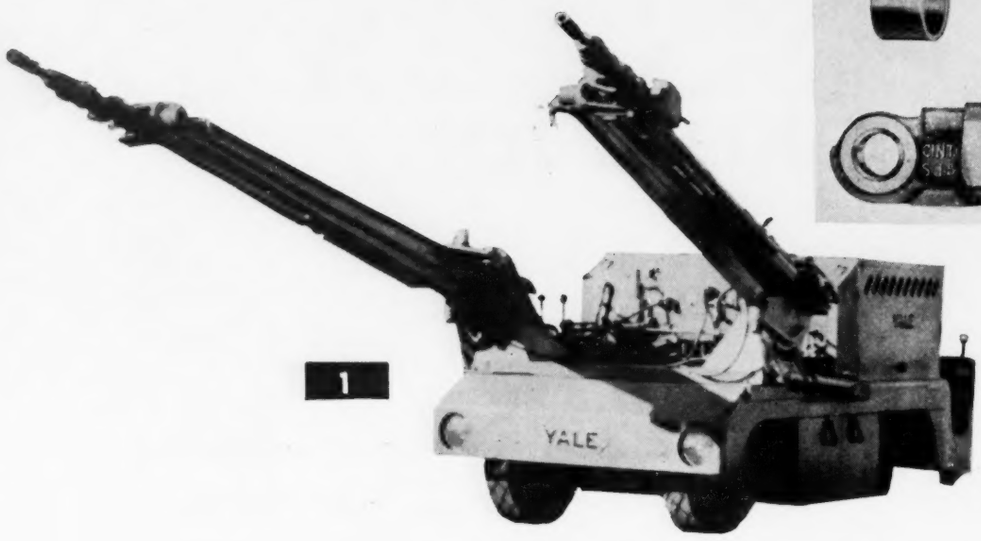


A. S. Knoizen
New Chairman, Manufacturers' Division
American Mining Congress

Latest developments in equipment, supplies and services for low-cost mechanical mining shown at 17TH ANNUAL EXPOSITION OF MINING EQUIPMENT, AMERICAN MINING CONGRESS

OVER 140 manufacturers and service organizations presented new and improved products for mines, shops and preparation plants at the 17th Annual Convention of Practical Coal Operating Men and National Exposition of Coal-Mining Equipment, held at the Music Hall, Cincinnati, Ohio, April 29-May 3, under the auspices of the Manufacturers' Division of the American Mining Congress. A. S. Knoizen, vice-president, Joy Mfg. Co., was elected division chairman for the coming year, succeeding Frank E. Mueller, vice-president, Roberts & Schaefer Co. E. J. Burnell, vice-president, Link-Belt Co.; E. F. Carley, manager, explosives division, E. I. du Pont de Nemours & Co., Inc.; and J. W. Haddock, vice-president, Sullivan Machinery Co., were chosen vice-chairmen.

Mechanical cutting, drilling and conveying equipment again bulked large in the exposition picture, supplemented by new rubber-tired mining and transportation equipment, including shuttle cars and drilling machines and larger mine cars especially for mechanical loading. The growing influence of mechanical mining also was reflected in new electrical control and distribution equipment; new materials, supplies and tools, such as explosives and coal breakers, roof and timber jacks and maintenance tools; and new safety equipment, including special rock dusters, methane alarms, signals, etc. In the preparation field, stress was laid on mechanical cleaning, screening and drying. For details of these and other developments, turn the page.



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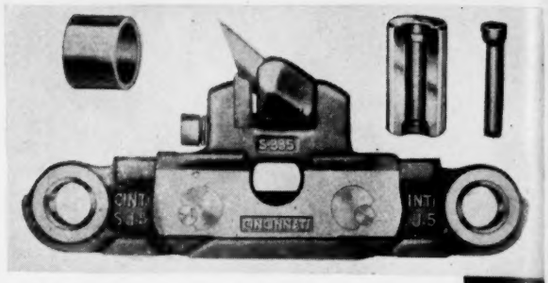

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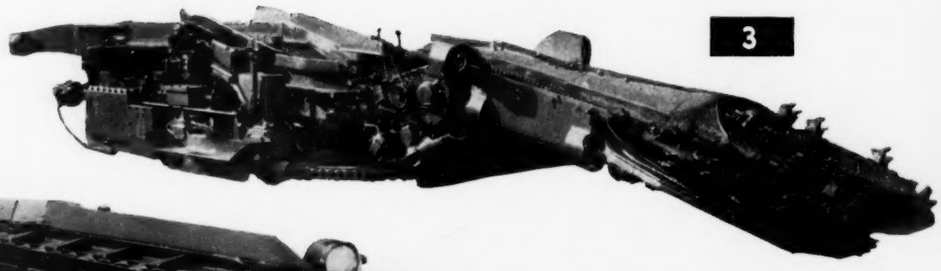

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Loading and Cutting Equipment
Drilling Machines

Air Reduction Sales Co., New York—Hard-surfacing of standard and throwaway cutter bits.

Barber-Greene Co., Aurora, Il.—Barber-Greene underground conveying equipment, featuring use of chain-type room conveyors discharging onto belt-type gathering, or "mother," conveyors; also Barber-Greene coal-mine transfer stations (dump hopper, feeder and car-loading elevator) permitting use of large mine cars or Fletcher rubber-tired haulage equipment at the face.

Bowdil Co., Canton, Ohio—Bowdil solid-alloy heat-treated cutter bars and chains; Bowdil secondary coal-cutting bits; Bowdil drill bits.

L. M. Brown, Inc., Homestead, Pa.—"Super Cesco Diamond" silicon-molybdenum-vanadium bits to cut more coal per point, reduce cutting time and save power; and the "Super" forging unit, comprising furnace and forging machine with new conveyor and cooling system, designed to forge the high-alloy steel used in the bits.

Chicago Pneumatic Tool Co., New York—Post-mounted electric coal drills, hand-held electric coal drills and other drilling equipment, including the No. 571 "Whippet" clutch-type hand-held drill in the permissible type, 400 r.p.m., 40-lb. weight; an improved clutch and gear housing for the standard mounted coal drill using a cam lever instead of a screw lever and easier to mount on the post; and a new trolley-hanger drill using a "Carboloy" steel bit and mounted on a lever-type post for quick positioning.

Chicago Pneumatic also displayed a model of a new mounted duplex coal drill of the self-propelling type available with either rubber tires or caterpillar or wheel running gear. The unit (Fig. 1), mounting two separate drills on individual arms, also is adapted to operation from either a battery or the trolley. It is available, according to the company, with three sizes of drilling motors capable of handling holes from 2½ to 5½ in. The unit is operated by two men, each of whom works independently. All movements of the drilling arms are hydraulically controlled.

Cincinnati Mine Machinery Co., Cincinnati, Ohio—Coal-cutting equipment—bars, chains, "Duplex" bits, etc.—for both standard and thin-kerf work, including a new Cincinnati cutter chain with renewable chain joint. Chief advantage of the joint (Fig. 2) is elimination of wear in the block and connector accomplished by using a hardened alloy-steel insert with a hardened eccentric pin flattened on one side to prevent turning. A rivet holds the bearing pin against longitudinal displacement. As the pin cannot rotate, all connector wear, the company states, is in the insert. Pin and insert may be replaced in a few minutes with simple tools, after which, it is declared, the pitch of the chain is exactly the same as the day it was made. Life of the chain therefore is limited only by wear of the flanges in the bar guides and by abrasive action of the coal against the head of the block.

Enterprise Wheel & Car Corporation, Bristol, Va.-Tenn.—Mining with the Smith pit-car loader (May, 1940, *Coal Age*, p. 29).

Goodman Mfg. Co., Chicago—Cutting, conveying and loading equipment and accessories, including: Type 212 19-in.-high low-vein shortwall cutter; Type 512 universal shortwall with Type 64 chain and throwaway bit; the latest-design Type 9730 troughed belt conveyor; shaker conveyors, drives and accessories; and the new Type 460 loading machine (Fig. 3).

Shaker-conveyor equipment included, in addition to lagged troughing, ball-type trough supports, a new jack-type trough support with roller hold-down and other accessories, a Type A3H automatic duckbill with new-type cast-steel shovel with improved throat opening to ease the coal into the pan line, a new-type ball-frame-type support for the connecting trough which insures straight-flow, rather than rocking, motion of the pan line, and a G-20 shaker-conveyor drive with a new-type 20-hp. flywheel motor, rounding out the company's line of flywheel-type drives.

The new 460 track-mounted loader follows the general lines of the 260 and 360 machines but is designed, according to the company, to facilitate loading coal in room necks turned at right angles to the heading and similar work where there is a problem in cleaning up the inside corner. The front conveyor therefore has been made about 2 ft. shorter and the swing has been increased to 110 deg., with 80-deg. on the fishtail-type rear conveyor. The machine is powered with only two motors, cutting down electrical parts and simplifying construction. One motor handles tramming, swinging and operation of the front conveyor, while the rear drives the rear conveyor and also operates the raising, lowering and swinging mechanism. Capacity of the 460 is the same as the 260 and 360.

The 460 machine also may be had with the new Goodman hydraulic control, using four valves for all front and rear and other motions except tramming. Pressure in the hydraulic circuits remains the same even when all motions are taking place simultaneously.

Haynes Stellite Co., New York—Hard-surfacing of cutter bits with "Stellite" and "Haystellite."

Jeffrey Mfg. Co., Columbus, Ohio—Loading, conveying, cutting and drilling equipment, including the 29-U track-mounted cutting machine, A-6 post-mounted and A-7 hand-held electric coal drills, chain- and belt-type conveying equipment and the improved 61-CL conveyor-loader 22½ in. high, equipped with rubber-tired wheels, especially designed for loading on conveyors and having a capacity of 1 to 1½ tons per minute (Fig. 4).

Joy Mfg. Co., Franklin, Pa.—Loading machines, drilling equipment and auxiliaries, including the 11-BU high-capacity loading machine for thick coal, the 14-BU high-capacity low-vein loading machine, caterpillar-mounted mining-machine trucks and mountings for cutting and shearing machines, room and entry conveyors, etc., and the new Joy safety coal drill (Fig. 5). The boring elements of the drill consist of an outer rotating cutter and an inner rotating pilot driven in opposite directions. All rotating parts are inclosed in a stationary tube and the cuttings are conveyed back to an opening at the back end of the tube for disposal on the ground or in a dust bag. Because the cutting elements rotate in opposite directions, there is no kick when the drill sticks, the company states. The drill is fitted with a 3-hp. motor and weighs, without the boring bar, 43 lb. Drilling speed is stated to be 7 to 9 ft. per minute.

La-Del Conveyor & Mfg. Co., New Philadelphia, Ohio—Conveying equipment of the chain, belt and shaker type, including a La-Del low-type side-drive reversible shaker conveyor and the new La-Del Type RB room belt conveyor with spool-type idlers and low-tension-type drive, suitable, the company states, for driving rooms as deep as 500 ft. The conveyor employs a knocked-down-type section with continuous side sheets to prevent spillage. The spool-type idlers are specifically designed with regard to maximum and minimum diameters, smooth surface and a contour which holds slippage or creepage to a minimum.

Link-Belt Co., Chicago—Pictorial display of crawler shovels and draglines.

McLaughlin Mfg. Co., Joliet, Ill.—McLaughlin drilling heads and bits for both twisted and conveyor-type coal drills; also both twisted and chrome-nickel-steel core forged-shank conveyor augers. Heads are designed to be welded to the augers and are of both the wedgeless and standard types accommodating tapered-shank or spiraled tapered-shank bits. Bits are made of

alloy steel and are heat-treated for maximum strength and resistance to wear.

Marion Steam Shovel Co., Marion, Ohio—Stripping and loading equipment, including the new 5561-E 35-cu.yd. dipper "knee-action" stripping unit installed by the Tecumseh Coal Corporation (Fig. 6). In this unit, the crowd mechanism is taken off the boom and mounted on the gantry, thus leaving the boom only the task of carrying the point sheaves. The new construction, it is stated, relieves the boom of the stresses and shocks of crowding and allows building it lighter. In addition, the "knee-action" front end permits the use of a larger dipper and greater working ranges. Because of the movable fulcrum construction employed, which corresponds to the shipper shaft, especially favorable digging angles and a long radius of clean-up are available, according to the company.

The Tecumseh shovel also includes automatically controlled hydraulic levelling and equalizing jacks, using both electric and hydraulic controls to secure automatic leveling either in digging or moving.

Mining Machine Parts, Inc., Cleveland, Ohio—Hard-facing of cutter bits by the electric-arc process using "Dymonhard"

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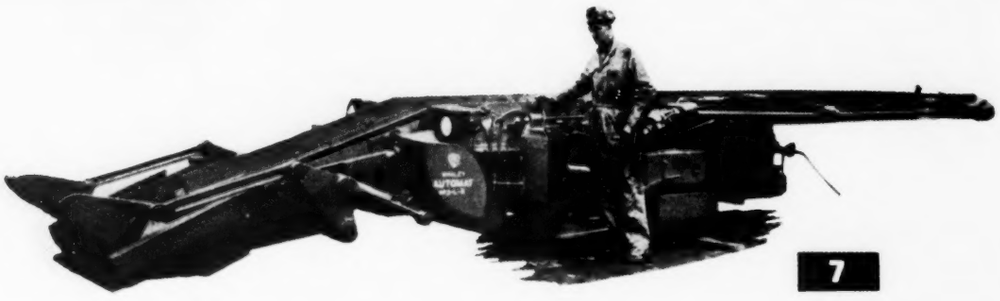

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rods of various characteristics. Complete fusion with the base metal is stressed by the manufacturer, with the result that the deposit will not chip or spall under the most severe service conditions. Other features include ease of application, perfect bonding; smooth, even overlay with little grinding or waste, perfect control of overlay depth, no porosity or checking, etc.

Myers-Whaley Co., Knoxville, Tenn.—Whaley No. 3-LS "Automat" track-mounted loading machine (Fig. 7) featuring "natural" shovel-loading motion, low-maintenance construction, safety and low power consumption. With the same capacity as other "Automat" loaders, the new machine has a minimum over-all height of 40 in. and can be used, according to the company, in 48-in. coal with a clearance for passage of lumps of 10 in. when the machine is on track 4 in. high. The reduction in height is obtained by a universal-jointed shaft to drive the rear conveyor. Rear-conveyor swing is controlled to prevent sudden movements, and the loader, it is stated, has no tendency to slew even in hard digging. It is mounted on roller-bearing axles, with anti-friction bearings in the transmission and on all shafts operating over 100 r.p.m. Shovel reach is 12 ft. to each side of the track, and the vertical working range is from 10 in. below to 10 in. above the rail. With a 25-hp. motor, maximum capacity is 7 tons per minute; guaranteed operating, 3 tons.

Frank Prox Co., Inc., Terre Haute, Ind.—Prox "Invincible ToolSteeL" cutter chains and factory-made heat-treated alloy-steel double-pointed cutting bits, stated to be quick and easy to change and to set automatically to gage.

Sullivan Machinery Co., Michigan City, Ind.—Sullivan 7-AU track-mounted universal cutting and shearing machine, 7-B "Super" shortwall cutter mounted on two-speed self-propelled power truck, a complete line of pneumatic drills and tools and an improved-type "Lohite" scraper loader comprising a hoe-type scraper, loading ramp and "Lohite" scraper hauler; also tail-rope sheaves for scraping and other cutting, drilling and scraping accessories.

Timken Roller Bearing Co., Canton, Ohio—Timken detachable rock bits.

Bertrand P. Tracy Co., Pittsburgh, Pa.—New-type high-strength all-welded cutter bar—no rivets. Features include wearing strips on the channels, easily replaceable channel-type chain guides and built-in connections for water sprays. All water connections, the company states, are easily accessible by removing a screwed-on cover plate. This bar, it also was pointed out, quickly can be brought back to new condition by replacing channels and cutter head, stated to be not over an hour's job. The Tracy cutter chain was another featured item.

Haulage With and Without Tracks Hoists and Auxiliaries

Air Reduction Sales Co., New York, N. Y.—Fabrication of frogs, switches, guard rails and other track accessories by gas cutting and arc-welding; samples of rail joints made by various methods, including a 60-lb. joint with No. 78 electrode stated to cost not over $1.30, and with R.R. rod and gas welding, not over $2.50.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Model HD-14 diesel-powered tractor, 108-drawbar-horsepower, 1 to 7 m.p.h., new-type track.

American Car & Foundry Co., New York—A.C.F. chilled-tread mine-car wheels, hitchings and accessories and A.C.F. mine cars, including the 10-ton Rochester & Pittsburgh Coal Co. car (Fig. 8) with double knee-action swivel trucks, A.C.F. chilled-tread wheels and Ohio Brass automatic couplers. Car specifications include: inside length, 18 ft. 6 in.; over-all length, 21 ft. 3 in.; outside width, 6 ft. 6 in.; height over rail, 3 ft. 6 in.; weight, 8,000 lb.; capacity, with a 6-in. average topping, 372 cu.ft. Features cited by the company include: a reduction of approximately 50 per cent in dead weight per ton of coal, easy rolling and operation around curves through the use of swivel trucks, and better ability to stick to the rails as a result of the flexibility of the knee-action trucks.

Bethlehem Steel Co., Bethlehem, Pa.—Light-weight high-capacity corrosion-resisting Mayari-R mine car built for the Berwind-White Coal Mining Co., including spring bumpers and depressed rear end for mechanical loading; No. 393 40-lb. steel-tie turnout, including welded-on slide plates, heel blocks, etc., and No. 1201 switch stand with reflector target; No. 1217 parallel-throw switch stand; No. 289 manganese-steel frog; a complete line of steel tires; forged-steel hitchings, pins, etc.; and forged-steel mine-car wheels mounted on heat-treated through axles.

Brown-Fayro Co., Johnstown, Pa.—Brownie rerailers for 20- to 60-lb. rails, "Brownie" mine-car wheels, and hoists and retarders. The HKL conveyor car-spotting hoist (Fig. 21, p. 72), a low-seam unit with an over-all height of 24 in., has a rated rope pull at full speed of 6,000 lb. The HGD conveyor auxiliary hoist (Fig. 9), described as a portable easily handled unit, is offered for dragging conveyor pans and supplies up to the working point. The RD electric car retarder is equipped with a Thrustor-operated brake and a torque motor capable of withstanding stalling loads for rewinding the rope. It is offered for handling both railroad and mine cars, and is rated at 12,000 lb. braking-rope load. Shock is eliminated, it is stated, because of the "soft" action of the Thrustor.

Carnegie-Illinois Steel Corporation (subsidiary of the United States Steel Corporation), Pittsburgh, Pa.—U.S.S. rails and steel ties; use of "Cor-Ten" high-tensile-strength corrosion-resisting steel in mine cars to raise capacity without increasing weight.

Differential Steel Car Co., Findlay, Ohio—Differential "Axless" mine cars and the Differential "Axless" locomotive used by the Hanna Coal Co. of Ohio.

Enterprise Wheel & Car Corporation, Bristol, Va.-Tenn.—Four-axle all-steel low-type high-capacity mine car with rubber buffer and spring drawhead. With a length of 12 ft. inside, a width of 6 ft. and a height of 26 in. over the rail, capacity is 108 cu.ft.

Flood City Brass & Electric Co., Johnstown, Pa.—New-design "Flood City" car-spotting hoist, now equipped with a 30:1 worm-gear reducer instead of the conventional cumbersome gear reduction. The reducer also prevents reversing, so that the drum is immovable when the motor is stopped. Equipped with a 5-hp. motor, the hoist provides a rope pull of 6,000 lb. at 35 f.p.m.

General Electric Co., Schenectady, N. Y.—Low-vein 26½-in.-high 15-ton haulage locomotive designed for the Jewell Ridge Coal Corporation (Fig. 10). Equipped with two 90-hp. (one-hour rating) motors operating through a double-reduction drive, the unit develops a speed of 7 m.p.h. at 250 volts and the rated drawbar pull of 7,500 lb. Starting tractive effort is 9,000 lb. Specifications include: 44-in. track gage, 248-in. over-all length, 90-in. wheelbase, 23-in. steel-tired wheels, width of 74 in. without and 84 in. with trolley sockets, link-and-pin couplers, straight air brakes with hand auxiliary, air-operated sanders, roller-bearing journal boxes, self-ventilation, Class B insulation and electro-pneumatic control—ten steps, motors in parallel only.

Gibraltar Equipment & Mfg. Co., St. Louis, Mo.—Car stops, derailers, rerailers, a complete line of "Gemco Tru-Blue" light-weight standard and ratchet-type rail benders, including the new B-12 bender for rail up to 120 lb. in weight (May, 1940, *Coal Age*, p. 83); parts for tool and supply cars to facilitate construction of such cars at the mines; standard and ratchet-type rail punches, including a new multiple-lever unit; track tools, including combination types; and other track specialties.

The new multiple-lever punch (Fig. 11) is featured by a system of links from bar socket to punch shaft which multiply

the leverage about three times and thus cut effort required in punching to less than half. The company also offers an adapter which clamps on any punch frame to convert it to the multiple-lever type.

In the new combination tools, one steel handle is designed so that any number of accessories or points, such as adjustable track-gage fittings, spike claws, shovels, hammers, picks, mauls, socket wrenches, threading dies and taps, fittings for bending pipe and conduit, rivet busters, mattocks, etc., may be bolted on. Thus, a large kit of tools may be made up with only one handle, which is of steel and therefore non-breakable, saving loss of time resulting from breakage and the cost of buying and fitting new handles. The tools are made with sockets lined with rubber to absorb shock and are held in place with a bolt and wing nut.

Guyan Machinery Co., Logan, W. Va.—Light-weight 530-lb. 1-hp. mine inspection car capable of carrying four men at 5 to 6 m.p.h.

Jeffrey Mfg. Co., Columbus, Ohio—Jeffrey hydraulic braking system for mine locomotives (Fig. 12), comprising a tank, motor, pump, accumulator, control valve, brake cylinders and the necessary hose and tubing. Stated to be quickly and easily installed on mine locomotives and to be ideal for tandem units, the system uses the same levers and shoes as the screw brake, retained for secondary use. Furthermore, according to the company, the unit requires less space, is cheaper than an air-brake system, and gives quicker and more effective braking than hand equipment.

Joy Mfg. Co., Franklin, Pa.—Joy low-vein shuttle car, 2½ to 4 tons capacity, and the Joy high-vein car, 5 to 6 tons, with new 3-point suspension for strength, smoother operation and better traction.

Lee-Norse Co., Charleroi, Pa.—Lee-Norse "Koal-Mobile" (Fig. 13), a cable-reel or battery-powered shuttle car in capacities from 2 to 10 tons featured by four-wheel drive, four-wheel steering, three-point suspension and two-speed magnetic control. The four-wheel drive, according to the company, provides a maximum of tractive effort for severe grade and starting conditions, distributes tractive effort to minimize roadway disturbances and insures ample traction-motor capacity.

A symmetrical dual control enables the operator to face in either direction of travel, while the four-wheel steering arrangement, it is stated, assures uniform clearance at both ends of the car during turning, as both the forward and rear wheels turn on the same radius. "Where one end goes, the other will follow." The unit, it is declared, turns on an 8-ft. radius and steers and handles with equal ease in both directions. "Backing" is eliminated. The three-point suspension assures a torsion-free body and maximum roadability.

Mancha Storage Battery Locomotive Co., Chicago—Pictorial presentation of battery locomotives.

Metal & Thermit Corporation, New York—Thermit welding equipment for eliminating rail joints and making mine tracks continuous.

Mine Safety Appliances Co., Pittsburgh, Pa.—New M-S-A "Velocity-Power" rail punch (Fig. 14)—a tool employing a blank cartridge to perform the punching operation and thus eliminating track drills and mechanical punching. The operation, the company points out, is instantaneous and requires no physical effort. Models available to date will punch a ¾-in. hole in 40-lb. rail and weigh about 40 lb. Including centering, etc., the performance is stated to be about 25 holes an hour.

National Malleable & Steel Castings Co., Cleveland, Ohio—Willison automatic mine-car couplers, "Naco" cast-steel mine-car wheels in plain and anti-friction-bearing types, hitchings, friction-type draft gear, etc.

Ohio Brass Co., Mansfield, Ohio—O-B automatic mine-car coupler employing rubber draft and buffing pads and a self-contained self-centering device, and designed to conserve space when mounted on the car.

Portable Lamp & Equipment Co., Pittsburgh, Pa.—The Portable line of "Track Tackle," including, in addition to new items, reflector-type switch-position signals, transition rails, compromise transition splices and holding and running skids, including two new units in the latter classification, one for 40- to 60-lb. rails and the other for 60- to 80-lb. rails. These skids are made of molybdenum malleable iron for maximum strength and wear with maximum natural friction.

New items included a 5½-lb. face stop at a new low price. The stop is installed by slipping it over the head of the rail, where it is in position to rock either way and jam tight when a car comes against it. It operates entirely on compression, the company states, and supplies five times the impedance. Another new Portable item was an automatic car-holding device for stopping and holding trips on a grade. Operating on the counterbalanced-weight principle, the stop permits the cars to run over it and then automatically raises to holding position, showing white and red reflector signals on the respective sides. To take the stop out of service, the counterweight is thrown over, whereupon the dog lies down on the ties.

A light-type one-way derail (Fig. 15) also was offered by Portable. This unit is bolted to the rail base and the derailing element starts with an angle of 5 deg., which increases to 8 and then 10 deg., or about in the same proportion as a turnout. Consequently, cars are eased, rather than knocked, off the rail. At the same time, car weight is carried on the rail rather than on the derailing element. As a result, the unit can be made much lighter.

A new crossover switch designed to permit the installation of a turnout without breaking the main track rails was another Portable item. It is offered for installation in place of seldom-used mainline turnouts, thus eliminating the hazard in high-speed haulage resulting from breaking the track, and also for putting in an extra track for car-storage or changing in a working place without the labor and expense of installing a standard turnout.

Sanford-Day Iron Works, Inc., Knoxville, Tenn.—Ball-bearing incline rollers, "S-D Floater" wheels in both ball- and tapered-roller-bearing types, ball-bearing 244-lb. tool-car trucks, other mine-car specialties and the Central Elkhorn Coal Co. 1-2-3 drop-bottom mine car with "Floater" wheels, spring draft and buff, and high-strength construction. With 12-ft.-long sides, a width of 5 ft. 9 in. and a height over the rail of 22 in., the car holds 2 tons level full.

Sanford-Day also offered the new Princeton Mining Co. "shuttle car" (Fig. 16) holding 9 tons and designed for use with a pit station transferring coal to smaller cars for hoisting. The shuttle car is equipped with six drop-bottom doors instead of three to reduce the depth of the transfer-station pit and also handle the coal easier. Fitted with "Floater" wheels with Fafnir ball bearings, the car has sides 15 ft. long, is 7 ft. 6½ in. wide and 40 in. high over the rails. Weight is 6,000 lb.

Sullivan Machinery Co., Michigan City, Ind.—Sullivan "Carpullers," room hoists, etc.

Watt Car & Wheel Co., Barnesville, Ohio—Pictorial presentation of its line of mine cars, including double-truck high-capacity equipment supplied the Hanna Coal Co. of Ohio.

Weir-Kilby Corporation, Cincinnati, Ohio—Complete line of track equipment, including switch stands and throws, spring connecting rods, switch slides and plates, switches, guard-rail clamps, switch-point clips, Weir "Titan" titanium- or manganese-steel frogs, etc.

West Virginia Rail Co., Huntington, W. Va.—Complete line of track equipment, including steel ties, cast frogs, switch stands, standard and sectionalized steel-tie turnouts, cast frogs and an addition for use with 30- to 40-lb. rails to round out the "Quik" rail-bender line. An improvement offered in plated frogs consists of hammering down the wings to prevent them from catching the low-type mine car when it is derailed. Steel ties were shown with a new clip with a heavy hammering lug on the flange end, strengthening the clip and making it easier to knock off the rail base.

Wood Preserving Corporation, Pittsburgh, Pa.—Koppers "Ar-moored" combination steel and treated-wood ties for room and room-entry service.

CINCINNATI EQUIPMENT EXPOSITION

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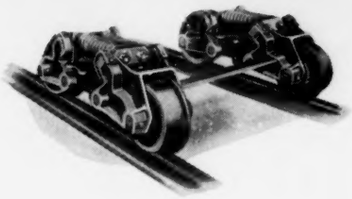

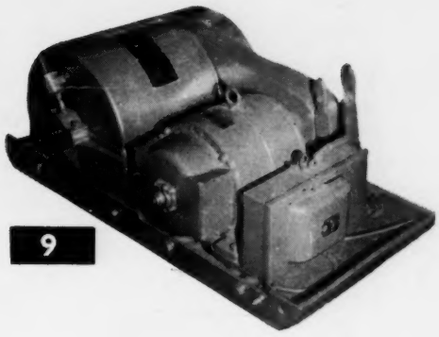

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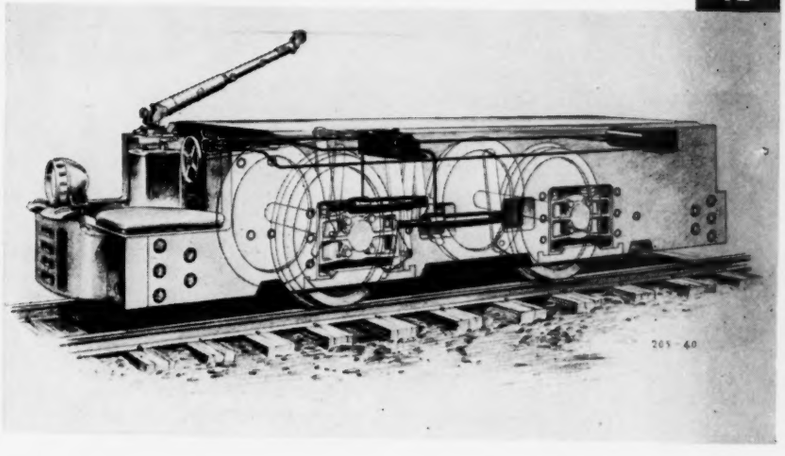

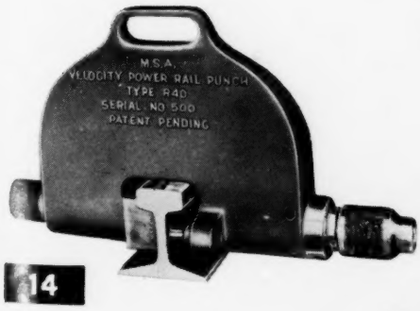

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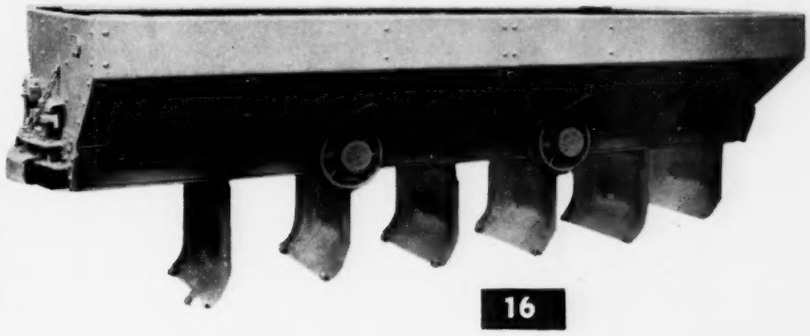

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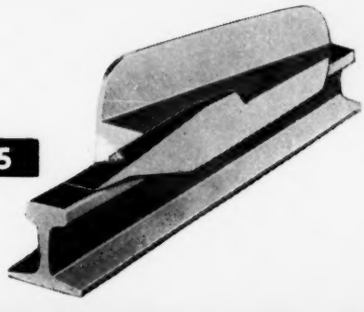

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Coal Preparation and Treatment Utilization Developments

Abbe Engineering Co., New York—Abbe-Greening wedge-wire screens in steel, stainless steel, brass and bronze for screening, dewatering and slurry removal in hoppers, on vibrating and other types of screens, and in centrifugal dryers, filters and other dewatering units.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Screening equipment, including 5x14-ft. triple-deck low-head horizontal vibrator with "Sta-Kleen" lower deck for preparation of small sizes, especially stoker.

American Steel & Wire Co. (subsidiary United States Steel Corporation), Chicago—Aerial-tramway waste-disposal systems.

Barber-Greene Co., Aurora, Ill.—Surface coal-handling and storage equipment, barge-loading equipment, including types used in the Huntington (W. Va.) terminal of the American Rolling Mill Co. (May, 1940, *Coal Age*, p. 37).

Bethlehem Steel Co., Bethlehem, Pa.—Mayari-R and other corrosion-and abrasion-resisting plates for coal-preparation and handling plants, including sample of plate which had handled over 50,000 tons of rock at an anthracite property.

Bixby-Zimmer Engineering Co., Galesburg, Ill.—Bixby-Zimmer "Tailor-Made" dewatering, dedusting and sizing screens of stainless steel, bronze, alloys or carbon steel in various shapes, styles and sizes of openings to fit all types of shaker, vibrator and stationary screens (Fig. 17). Fabricated of round wire or rods, the screens are built up by welding. Tension, according to the company, therefore is built into the screens and only a minimum number of fastenings are required for quick installation. There are no members to work loose, and elimination of distortion or bending in assembly increases life. Openings are continuous over the supporting rod and 50 per cent of the round wire, or rods, may be worn away before the screen openings begin to enlarge, it is pointed out.

Brown-Fayro Co., Johnstown, Pa.—"Brownie" 2F8 high-pressure oil-spray pump for dustproofing coal with cold oil; capable of delivering 15 g.p.m. at a normal working pressure of 600 lb. per square inch.

Calcium Chloride Association, Detroit, Mich.—Dry feeding of calcium chloride into coal for either dustproofing or freeze-proofing.

Carnegie-Illinois Steel Corporation (subsidiary United States Steel Corporation), Pittsburgh, Pa.—"Cor-Ten," "Man-Ten" and special abrasion-resisting "A-R" steel for strength and wear resistance in chutes, screens, etc.

Central Electric Repair Co., Fairmont, W. Va.—Tramp-iron magnet for use on shaker screens, in chutes and at the ends of loading booms, belt conveyors, etc.

Centrifugal & Mechanical Industries, Inc., St. Louis, Mo.—Elmore continuous centrifugal dryer for coal.

Deister Concentrator Co., Fort Wayne, Ind.—New "Super-Duty" No. 7 Deister-Overstrom "Diagonal-Deck" coal washing table powered by the new "Concenco" anti-friction-bearing, self-oiling fully inclosed head motion; other "Diagonal-Deck" coal-washing tables; Leahy heavy-duty "NO-Blind" screen with "Tri-Vibe" feature; and "Concenco" spray nozzles for both average and heavy washing duties.

Deister Machine Co., Fort Wayne, Ind.—Deister "Plat-O" coal-washing tables, including late-type high-capacity models—"100-per-cent greater capacity"; Deister "Plat-O" vibrating screens—adjustable cushioned vibration, freedom from blinding, with flat screening angle and automatic tensioning.

Differential Steel Car Co., Findlay, Ohio—Pictorial presentation of Differential three-way-dumping refuse-disposal larries.

Thomas A. Dillon, Toronto, Canada—Dillon "Full-Floating Circle-Throw" vibrating screens. Features cited by the company include: full-floating eccentric vibrating assembly in both static and dynamic balance; low power consumption—"about one-half"; positive circle-throw vibrating action; minimum transmission of vibration to supporting frame; simple design; strong construction; low first and upkeep costs; compact design; easy installation; and smooth, quiet operation.

Hendrick Mfg. Co., Carbondale, Pa.—Featuring stainless-steel dewatering screens; also perforated screen plates, including the late-type overhanging lip screen for better clearing with irregular-shaped lumps; dewatering-screen plates; grilles; gratings; etc.

Illinois State Geological Survey, Urbana, Ill.—Correlation of British swelling index with the behavior of Illinois-stoker coals. Survey research projects, including coal chemistry and smokeless-briquet development; manufacture of briquets without binder; stoker fuels; Illinois preparation methods; etc.

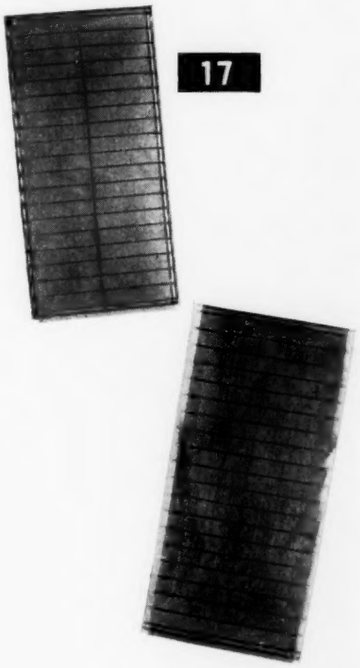
Jeffrey Mfg. Co., Columbus, Ohio—Jeffrey "Pre-Engineered" unit washeries for small tonnages, the new Jeffrey "Mass-Flo" conveyor-elevator (May, 1940, *Coal Age*, p. 83), stated to be self-cleaning, devoid of slippage past flights, able to operate when only partially loaded, and provided with hinged flights for perfect discharge; Jeffrey electric vibrating grizzly feeder; Jeffrey-Traylor electric vibrating "Conveyanscreen"; Heller piano-wire screen cloth; slow-speed "Flextooth" crushers for crushing to smaller sizes with a minimum of fines; and a number of Jeffrey coal-handling items, such as chain-and-flight conveyors, apron conveyors and booms, and belt-conveyor equipment, including Jeffrey Jr. idlers, Jeffrey-Reliance picking-belt idlers and Jeffrey-Reliance self-aligning idlers.

Johnson-March Corporation, New York—Dustproofing of coal by the "Coaladd" process, in which dry, granular "Coal-add," received in 100-lb. paper bags, is mixed with water and sprayed on the coal. Properly done, according to the company, this treatment eliminates 95 per cent of all perceptible dust. The treatment, it is stated, does not injure iron, steel, rubber or compound belting, and reduces fly ash and degradation.

Kanawha Mfg. Co., Charleston, W. Va.—Belknap calcium-chloride washers.

Koppers-Rheolaveur Co., Pittsburgh, Pa.—Menzies cone-separator coal-washing equipment and other preparation equipment and services.

Link-Belt Co., Chicago—Coal-handling, preparation and firing equipment, including the Link-Belt air-pulsated jig, the Link-Belt "Roto-Louvre" heat dryer and a new two-roll coal sizer (Fig. 18) with motor-operated mechanism for au-



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tomatically adjusting the roll centers to the size of coal being crushed.

McNally-Pittsburg Mfg. Corporation, Chicago—Pictorial presentation of the company's coal-preparation equipment, including McNally-Norton and McNally-Vissac washing units, McNally-Norton vertical pick breakers and stoker-coal sizers, McNally-Pittsburg Vissac heat dryers, etc.

Morrow Mfg. Co., Wellston, Ohio—Morrow standard washing unit with a capacity of 100 tons per hour; Morrow tipple and screening services, perforated plate and other preparation equipment.

Nordberg Mfg. Co., Milwaukee, Wis.—Symons horizontal vibrating screen featuring a new feed-end drive to facilitate and simplify installation of distributing chutes for the various sizes and reduce their cost.

Productive Equipment Corporation, Chicago—"Selectro," "Gyroset," "Jigger" and "Mud-Hog" vibrating screens, featuring the "Selectro" dewatering screen with double horizontal vibration. Field experience with this screen, the company pointed out, indicates that it will consistently reduce the surface moisture in $1\frac{1}{4}$-in.x10-mesh coal to less than 5 per cent.

Roberts & Schaefer Co., Chicago—The Stump "Air-Flow" coal cleaner, 1940 model, and a scale model of the Raymond flash-drying system for dewatering small coal (March, 1940, *Coal Age*, p. 93).

Robins Conveying Belt Co., Passaic, N. J.—Coal-preparation and handling equipment, including new types of belt-conveyor idlers, such as the "Rubber-disc" return idlers for use where abrasive, corrosive, damp or sticky materials are handled, and the new "Eliptex" vibrating screen (Fig. 19). This screen is described as a flat unit taking up a minimum of headroom and using an elliptical motion resulting in extremely accurate sizing plus a feeding action horizontally along the screen surface. The entire screen is cushioned on heavy coil springs and a new, simple friction check keeps motion under control during starting and stopping.

John A. Roebling's Sons Co., Trenton, N. J.—Screen cloths in various types and materials for coal sizing.

Shell Oil Co., St. Louis, Mo.—Spray products for dustproofing coal, including a new petroleum-resin blend stated to have a high viscosity and to give excellent results on the hardest-to-treat types of Illinois and Indiana coals. The product, it is pointed out, will stay on the surface in a tacky condition and pick up the dust.

Simplicity Engineering Co., Durand, Mich.—Simplicity gyrating coal screens, rubber-cushioned and designed to eliminate blinding.

Standard Oil Co. of Indiana, Chicago—New line of spray oils for dustproofing coal.

Stephens-Adamson Mfg. Co., Aurora, Ill.—"Air-Sand" dry coal cleaner for mixed sizes from 5 to $\frac{1}{4}$ in. in capacities from 50 to 150 tons per unit per hour; the Redler conveyor-elevator system for conveying and elevating coal and other pulverized, granular, small-lump and flaky materials; "Tellevel" automatic storage control for regulating the level of bulk or liquid materials in bins or tanks; "Truss-Frame" belt carriers with pre-sealed grease-packed cartridge-type bearings.

Sun Oil Co., Philadelphia, Pa.—"Coal-kotes" for dustproofing all types of coal and coke.

W. S. Tyler Co., Cleveland, Ohio—Latest Type 400 electric screen for fine-mesh screening; two-deck "Ty-Rock" high-speed circle-throw low-angle rubber-cushioned screen for coarser-mesh screening; screen cloths, etc.; Tyler-Niagara dewatering screens.

U. S. Bureau of Mines, Washington, D. C.—Liquefaction of coal by hydrogenation, showing yields of motor fuel, oil and byproducts; a suggested commercial continuous coal-hydrogenation plant.

Viking Mfg. Co., Jackson, Mich.—Viking dual heating system for coal-treating with heavy oils and waxes; samples of fog-tight curtains for reducing fluid loss in treating; and the A. R. Powell-C. C. Russell dust-testing cabinet.

West Virginia Geological and Economic Survey, Morgantown, W. Va.—Geology of the West Virginia coal fields and types of coal produced.

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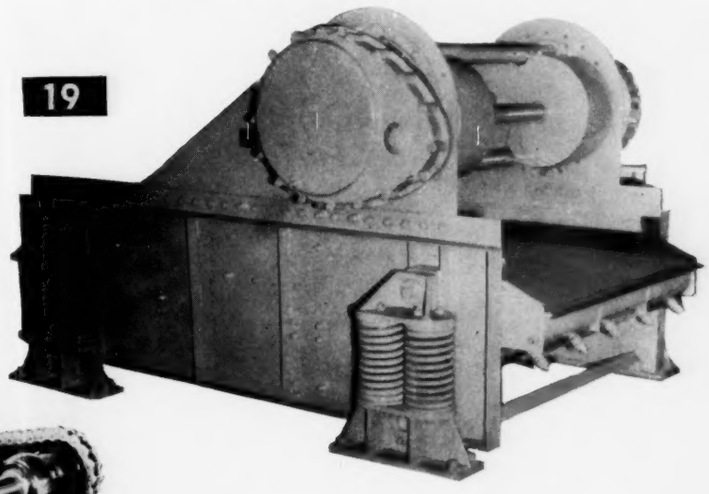

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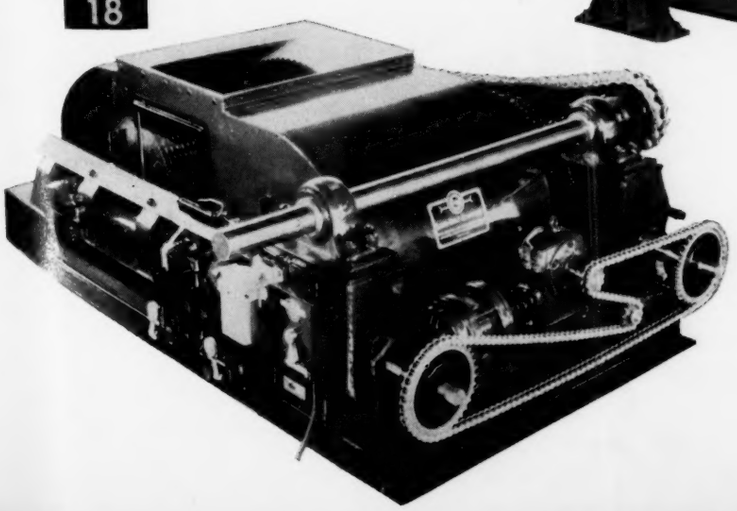

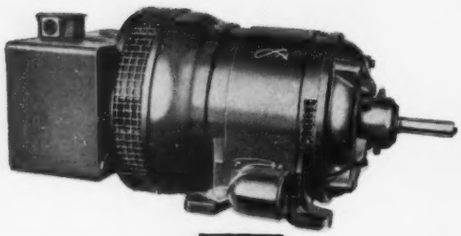

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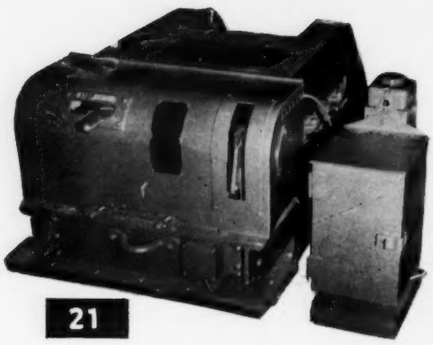

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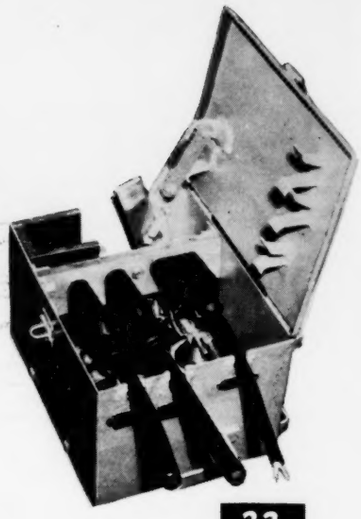

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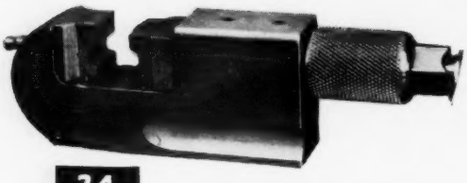

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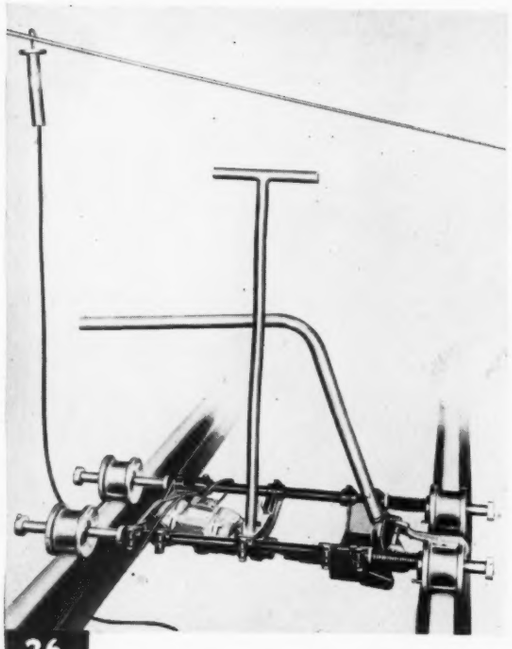

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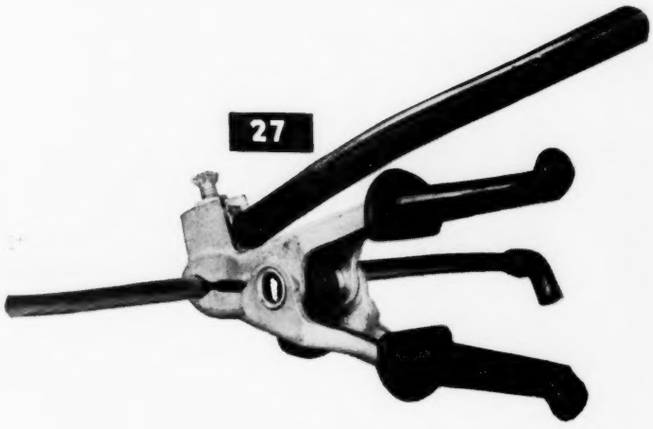

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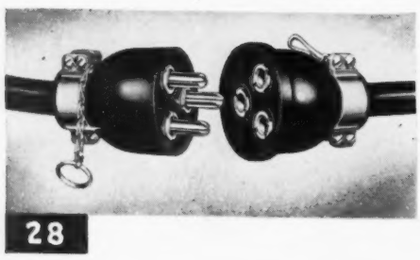

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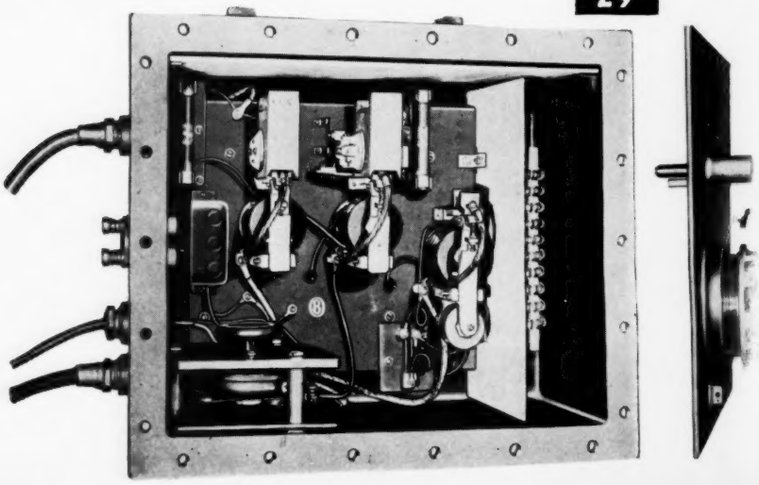


Power for Mechanical Mining Service and Control

Louis Allis Co., Milwaukee, Wis.—Special dust-, explosion- and splash-proof motors for underground and surface applications and the new "Adjusto-Spede" drive (Fig. 20), described as "an entirely new principle in a.c. adjustable-speed motors." The drive employs a new eddy-current clutch in combination with a standard constant-speed squirrel-cage motor. Both are contained in a single housing, with a separately mounted rheostat for controlling clutch excitation and consequently the speed of the output shaft from zero to full rating. This rheostat may be located any reasonable distance away. There is no mechanical connection between the driving and driven parts of the clutch.

Some of the characteristics cited for the eddy-current clutch are: 95 to 97 per cent efficiency under conditions of maximum excitation and maximum slip; 150 to 250 per cent of the normal full-load torque of the motor; gradual or quick acceleration; rapid intermittent starting or dropping of the load; service as a speed control with indefinite slip and control of torque transmitted; absorption of torsional impulses and vibrations; and ability to slip or drop load manually or automatically in response to speed or load or both.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Controls for all types of motors, including the "Ruptor-equipped" AP-7 and A-32 across-the-line units and push-button control stations, and a.c. and d.c. motors in the open, semi-inclosed and totally inclosed (dust-tight, explosion-proof, etc.) types.

American Steel & Wire Co. (subsidiary United States Steel Corporation), Chicago—Rail bonds, including "Tigerweld" types, "Amerclad" rubber-covered wires and cables, "Amercore" electrical wires, "Amerbestos" cable, "Amerglas" magnet wire, trolley and bare stranded wire, the A. S. & W. armored borehole cable suspension, and the company's new "conducting rubber" for use on high-voltage cables. This new rubber, it is stated, provides both internal and external shielding; restricts voltage stress to the cable proper, prevents corona formation, lessens the possibility of shock through contact, and protects metal coverings against electrolysis.

Anaconda Wire & Cable Co., New York—"Sunex Securityflex" mining cable, Parkway, "Duraseal" and "Durasheath" cables, shotfiring cord, telephone wire, magnet wire, trolley wire, welding cable, "Duracord" conductors, locomotive and mining-machine cables, etc.

Bowdil Co., Canton, Ohio—Bryant "Choke Arc" locomotive transfer switches.

Brown-Fayro Co., Johnstown, Pa.—The new "Brownie" Type SH magnetic switch (Fig. 21) suitable for a maximum duty of 100 amp. at 600 volts d.c. The switch is provided with a line fuse and separately mounted pushbutton station.

Central Electric Repair Co., Fairmont, W. Va.—Field-coil tester.

Thomas A. Edison, Inc., West Orange, N. J.—Edison nickel-iron-alkali storage batteries for mining service.

Electric Controller & Mfg. Co., Cleveland, Ohio—Type LZH 2,300-volt, wall-mounted oil-immersed across-the-line starter for motors up to 300-hp. Arc-rupturing capacity is 10,000 kva. and the unit is equipped with a self-contained potential transformer for the operating circuit. E. C. & M. also showed its Form X mine sectionalizer, described as the simplest unit in its sectionalizing line; also its Form XLP with adjustable time delay and "feeler circuit."

Electric Railway Equipment Co., Cincinnati, Ohio—Section insulators and switches, quick-break switches, trolley-pole items, and a complete line of standard and special overhead-line materials and splicing equipment, including a new dead-ending unit and a new universal cable and wire tap. The dead-ending unit is equipped with jaw-type clamps insulated with mine hangers, this construction avoiding breakage resulting from bending wire to put it through an eye. The unit takes the larger sizes of trolley wire, while a second type is designed for stranded feeder, etc. The universal cable and wire tap, comprising two ½-in. J-bolts and two bronze holding castings, is distinguished by simplicity and low cost. It will accommodate wire and cable from 1,000,000 circ.mils down to 4/0.

The new "Elreco" junction box (Fig. 22), designed to serve a mining, machine, loading machine and drill, each with separate trailing cables, was another offering. The box also may be made with a smaller or larger number of connections. The case is steel, with the main switch interlocked so that opening the lid kills power on all parts except the incoming binding post. While the lid is closed, none of the trailing-cable plugs can be pulled. The box employs standard fuses, standard mine hangers as insulators, Miller connectors and safety ground.

Electric Railway Improvement Co., Cleveland, Ohio—Rail bonds for mining work, including short-length lower-cost units; also welding equipment and rods for bonding.

Electric Storage Battery Co., Philadelphia, Pa.—"Exide-Ironclad" shuttle-car batteries; MVM, TLM, MEH and FLM locomotive batteries.

Flood City Brass & Electric Co., Johnstown, Pa.—Cable vulcanizers, automatic locomotive transfer switches, government-approved d.c. motor starters, overhead-line materials, section-insulator switches, etc.

General Electric Co., Schenectady, N. Y.—Pictorial presentation of mercury-arc rectifiers; starting units, including (1) CR-4850 magnetic non-reversing and CR-4850-C5B magnetic reversing d.c. starters built to U. S. Bureau of Mines specifications, (2) CR-4061-C1B mine-type magnetic d.c. starter with instantaneous and thermal overload protection and corrosion-resisting design for low maintenance and (3) CR-7006-D7P full-voltage magnetic a.c. starter in dust-tight case for tipple and other service; gearmotors; Type CD d.c. motor; Type CY-302 totally inclosed explosion-proof motor for loading-machine service; pushbutton stations of various types; Type AE-1B air-circuit breaker for cross-entry circuit protection; Tellurium portable cables; "Versatol" for tipple wiring; "Flamenol" synthetic-insulated wires and cables; varnished-cambric high-voltage cables; "Formex" magnet wire; "Glyptal" leads; and locomotive transfer switches and controls, including a new drum-type cam-operated controller for gathering locomotives serving loading machines.

Goodman Mfg. Co., Chicago—Style A conveyor-control panel, including a standard drum-type reversing controller for belt operation, permitting reversal to handle materials and men, with push-buttons for the control of subsidiary shaker or chain conveyors.

Gould Storage Battery Corporation, Depew, N. Y.—300-amp.-hr. Gould "Kathanode GlassKlad" shuttle-car battery providing, according to the company, "20 per cent more capacity all day long."

Guyan Machinery Co., Logan, W. Va.—Locomotive, mining-machine and slip-ring motor resistances; GMC choke resistance for permanent connection to d.c. motors for automatic starting after power interruptions.

I-T-E Circuit Breaker Co., Philadelphia, Pa.—LDR load distributor (March, 1940, *Coal Age*, p. 47); KSA switchboard-type automatic-reclosing circuit breaker to handle d.c. end of full-

automatic substation with, among other improvements, redesigned arcing gear and chute for greater dependability and longer life; KSC automatic-reclosing sectionalizing circuit breaker with cabinet refinements for greater convenience and protection underground and such control improvements as an arrangement for removing the bridging resistance after the breaker opens and reinserting it momentarily before the completion of the time cycle, thus giving anybody in the wire a few current-free seconds to get out and also eliminating the possibility of the bridging current affecting automatic-starter relays.

I-T-E also exhibited a 600-amp. 2-pole 250-volt Type ETB manually operated circuit breaker for protecting isolated or infrequently used circuits against high-resistance grounds and heating of the circuit. One pole is equipped with a magnetic overload arrangement for instantaneous opening in case of short circuits, while the other pole includes a thermal time-delay trip to prevent annealing of the circuit and eliminate the possibility of fires due to hot wires.

Mines Equipment Co., Michigan City, Ind.—Miller cable connectors; Miller rubber-cable vulcanizers; and the Miller spot heater (Fig. 23) for quick soldering of cable connections prior to vulcanizing. The splice, made with a special connector, is heated electrically and a special solder run in through holes in the connectors. Only a few seconds, the company says, is required for the job and the joint, which is very short, develops 90 per cent of its original strength with a diameter increase of only $\frac{1}{8}$ in.

Mine Safety Appliances Co., Pittsburgh, Pa.—New "Velocity-Power" cable splicers (Fig. 24) using copper-tube connectors and blank cartridges for power. The finished splice is said to be very little larger than the original diameter of the conductor, facilitating vulcanizing; also, it is only $\frac{7}{8}$ in. long and therefore the spliced cable will roll around reels without difficulty. All loose wire ends are inclosed in the copper-tube connector and therefore cannot work through the insulation and possibly cause shorts. Only 1 in. of cable is required for a splice, thus saving cable and labor in preparation and labor and time in actual splicing. The human element, it is stated, is less a factor in getting a good splice. Weight of the unit is about $7\frac{1}{2}$ lb. and dies and connectors are available for conductor sizes from 2/0 down.

National Carbon Co., Inc., Cleveland, Ohio—Electric-motor brushes and other carbon products.

National Electric Coil Co., Columbus, Ohio—Engineered coil service.

Ohio Brass Co., Mansfield, Ohio—In addition to a complete line of overhead line materials and rail bonds, including the wedge-type bond and the new AW-21 steel arc-weld bond (Fig. 25), which hugs the splice bar for a short resistance path and it fitted with convenient hooks for welding, Ohio Brass demonstrated a portable electric track drill (Fig. 26) for wedge bonding. A stiff handle makes it easy to trundle the drill, making a hole in 20 seconds under normal conditions, from place to place on the rails.

Sectionalizing switches, quick-break feeder switches, ball-nip fused trolley taps, ground-clamps and other electrical products also were included in the Ohio Brass exhibit, along with locomotive headlights and resistances, resistance welders and the new plier-type ground clamp (Fig. 27) with rubber handles and an adjustable cable grip accommodating a variety of conductors.

Featured Ohio Brass items included a comprehensive line of connection and control equipment, including multiple junction boxes, permissible fused gas-tight junction boxes, triple-pole connectors, a new cable-junction plug and automatic d.c. motor starters, including the new Type ADG explosion-proof unit. The new cable-junction plug (Fig. 28) is offered for splicing of trailing cables quickly and simply without vulcanizing. With a spring lock, the connector closes with a wedging action for good contact. The phosphor-bronze plugs are arranged to make improper connection impossible. A special clamping arrangement takes the strain off the cables. Various sizes of 3- or 2-conductor cables can be installed in the plug body in the field.

The new ADG explosion-proof automatic d.c. starter (Fig. 29) was especially designed, the company states, for conveyor operation in gaseous territory. A special pushbutton arrangement makes it possible to reset the thermal-overload trip without opening the case. Heavy steel sections, ground and threaded throughout, confine any explosion inside the box. The starter may be fitted with a reversing switch and also pushbutton, remote pushbutton or float-switch control.

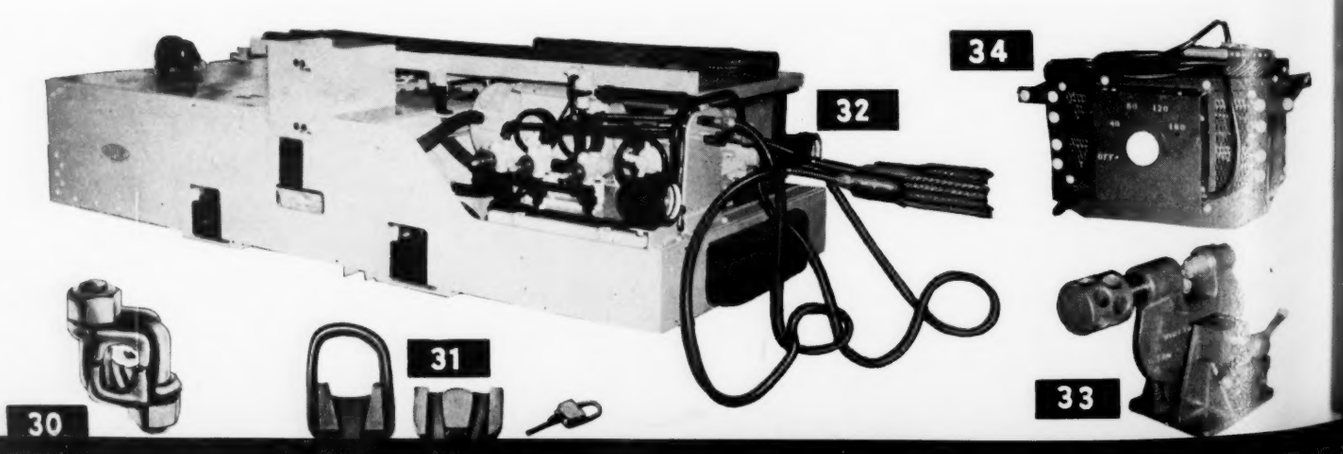
Ohio Carbon Co., Cleveland, Ohio—Ohio carbon brushes, including a new collector ring brush for General Electric cable reels comprising a permanent case is used, in which replacement inserts may be installed. The design, the company declares, makes it possible to use an extremely non-abrasive material in the brush because great mechanical strength is not required. Also, soldering is eliminated and the shunt made an integral part of the brush assembly. Reduced initial and maintenance costs are claimed.

A new commutator-burnishing tool also was offered, Ohio Carbon pointing out that it is not a stone and is not intended to replace lathe turning or rough stoning. Instead, it is strictly a maintenance tool for removing objectionable film and providing a high polish conducive to longer brush life. The material, it is stated, has a long life and does not cause copper deposition between bars.

Owens-Corning Fiberglas Corporation, Toledo, Ohio—"Fiberglas" insulation for electrical equipment.

Penn Machine Co., Johnstown, Pa.—"Super-Weld" rail bonds, including the "Everlast Super-Weld," TP-9 removable "Super-Weld," minimum-length PM-10 "Super-Weld" joint types and U-bonds.

Pennsylvania Electric Coil Corporation, Pittsburgh, Pa.—Coils for mining equipment, including a new design of double-involute glass-insulated coil with auxiliary mica strips to prevent wear and abrasion of the insulation, and "Vacuum Bakelized" field coils stated to practically equal Class B insulated coils through use of a special heat-reactive heat-resistive high-dielectric varnish. This varnish, according to the company, will not soften after curing, is oilproof and waterproof and acid-resisting, dries internally regardless of coil depth and is the "strongest bond-



ing varnish known." Large shunt-field coils are wound with wires insulated with enamel and paper. Coils are sealed on the outside with acid-, oil- and water-resisting varnish.

Philco Corporation (Storage-Battery Division), Philadelphia, Pa.—Storage batteries for mine haulage, including the new type AMH 1,000-amp.hr. unit; molded "monobloc" assemblies; and the Type 13XL 330-amp.hr. shuttle-car battery.

Post-Glover Electric Co., Cincinnati, Ohio—Complete line of P-G chromium-steel resistors; automatic locomotive transfer switches; and P-G d.c. starters.

John A. Roebling's Sons Co., Trenton, N. J.—Roebling wires and cables, coils, etc.

Rome Cable Corporation, Rome, N. Y.—Complete line of insulated wires and cables, including "Rome 60" trailing cables featured by high adhesion of the insulation to the conductor.

Simplex Wire & Cable Co., Cambridge, Mass.—Simplex "Anydrex" waterproof non-absorbent telephone, borehole and distribution cables; Simplex "Tirex" cords and cables with new identification markings on the jackets, detailing number of conductors, stranding, voltage, cable type, etc.

Sullivan Machinery Co., Michigan City, Ind.—Sullivan portable safety lighting cables.

Superior Carbon Products, Inc., Cleveland, Ohio—Superior carbon, graphite and metal-graphite brushes for mining equipment, with new tinned-wire shunts to resist oxidation and glass-fabric sleeving to replace the "bulky, unwieldy lava beads and combustible cotton sleeving."

United States Rubber Co., New York—"U. S. Royal" mining-machine cables with "triple-tempered" rubber insulation; other electrical wires and cables for communication, power transmission, lighting, etc.; "Holdtite" friction tape.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—Overhead line materials, SK motors, d.c. controllers, explosion-proof starters and the 46-in. high Hanna Coal Co. of Ohio 300-kw. portable Ignitron mercury-arc rectifier, 4,000 volts a.c. to 275 volts d.c.

Operating Materials and Supplies Maintenance Aids

Air Reduction Sales Co., New York—Oxygen and acetylene; oxyacetylene regulators; cutting and welding torches; "Twin-Hose" welding hose; Airco-DB No. 10 "Radiagraph" for machine cutting of switch points, frogs, shapes, etc., with a larger No. 4 machine for the same purposes and also for use with flame-hardening; reclamation of gears, pinions, etc., with various types of rods; low-temperature brazing of copper trolley wire with Handy-Harmon "Easy-Flo" and "Handy" flux; brazing of galvanized materials with Airco No. 20 or 22 rod and "Hi-Test" flux without damaging the galvanizing; etc.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—"Texrope" drives for coal-mining equipment; "Texrope" sheaves; "Vari-"Pitch" speed changers, ½ to 75 hp.; "Vari-Pitch" and "Vari-Motion" drives.

American Chain & Cable Co. (American Cable and Hazard Wire Rope divisions), Bridgeport, Conn.—"Tru-Lay" and "Lay-Set" preformed wire ropes.

American Cyanamid & Chemical Corporation, Explosives Dept., New York—Dynamites, permissibles, pellet powders, blasting supplies.

American Steel & Wire Co. (subsidiary United States Steel Corporation), Chicago—"Tiger-Brand" hoisting and other wire ropes and fittings; "Excellay" preformed wire rope and the new "Tiger-Laughlin" safety clips (Fig. 30), which are said to be safer and require no special tools to apply, cannot be put on wrong, have greater holding power and will not damage the rope.

Atlas Powder Co., Wilmington, Del.—New sheathed permissible explosives with reduced flame length for greater safety, improved fumes and smoke, and production of better-quality coal. These explosives are permitted during the working shift in certain States where unsheathed permissibles or other explosives are prohibited.

Bethlehem Steel Co., Bethlehem, Pa.—Wire ropes, stressing preforming and "Bethanizing" to resist corrosion.

Bowdil Co., Canton, Ohio—Bushings for mining equipment and the Bowdil rope socket (Fig. 31). This socket, the company declares, can be installed in two minutes without tools. To remove the rope the cap is knocked off.

Broderick & Bascom Rope Co., St. Louis, Mo.—"Yellow-Strand" standard and "Flex-Set" preformed wire rope; B. & B. slings of all types.

Cardox Corporation, Chicago—Carbon-dioxide method of breaking down coal, with shell sizes and rupturable disks for all conditions.

Carnegie-Illinois Steel Corporation (subsidiary United States Steel Corporation), Pittsburgh, Pa.—Four new steel room timbers ranging from 16 to 20 ft. in length and designed for use with wooden legs. They are said to be particularly suitable for use in mechanized mines, where they permit widening places, reduce the number of single posts needed, conserve headroom, promote safety, last longer and cut cost.

Chicago Pneumatic Tool Co., New York—Maintenance and repair tools—drills, nutrunners, grinders, chipping hammers, riveters, etc.

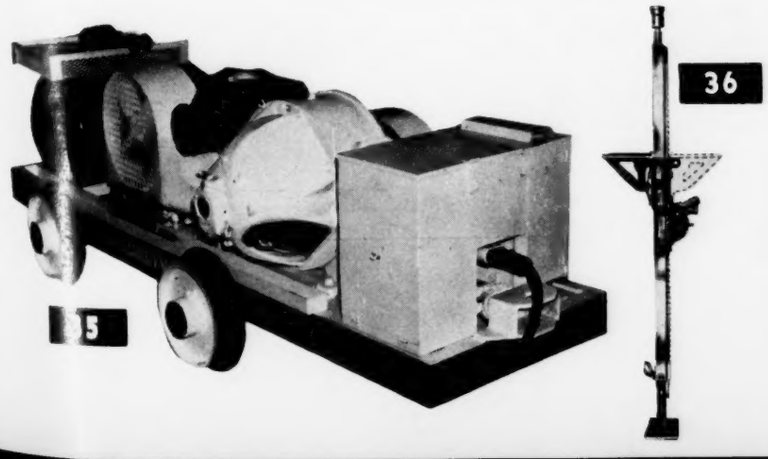
Cities Service Oil Co., Pittsburgh, Pa.—Mining lubricants.

Coal Mine Equipment Sales Co., Terre Haute, Ind.—Used and rebuilt equipment.

Coffing Hoist Co., Danville, Ill.—"Safety-Pull" ratchet-lever hoists and load-binders; "Power-Master" gravity-lowering chain hoists; Model C spur-gear chain hoists; differential hoists and trolleys; and the new "Quik-Lift" electric hoists in 29 different sizes and speeds.

Duff-Norton Mfg. Co., Pittsburgh, Pa.—Jacks, pullers and tools, including an adjustable timber jack with positive non-slip rack-and-pinion lifting device for raising heavy beams from floor to roof, a line of 5-ton automatic lowering jacks, mine roof jacks with a variety of heads, and other types of tools, such as a ball-bearing screw jack, four-way chain jack, journal jacks, trip or track jacks and the No. 55 pinion puller with worm and screw action, full ball thrust bearing, uniform pull and ability, according to the company, to remove any pressed pinion within the range of the jaws.

E. I. du Pont de Nemours & Co., Inc., Wilmington Del.—Pumping and control unit (Fig. 32) and tubes for the du Pont "hydraulic mining process" (April, 1940,



Coal Age, p. 67), stated to be infinitely safer, produce more and firmer lump and lower costs in many mines; du Pont permissible explosives and blasting accessories; and du Pont chromated zinc chloride for timber treatment.

Flood City Brass & Electric Co., Johnstown, Pa.—Bushings for mining equipment.

General Electric Co., Schenectady, N. Y.—Arc-welders and accessories.

Gibraltar Equipment & Mfg. Co., St. Louis, Mo.—"Gemco Tru-Blu" shop tools, including an adapter (Fig. 33) to permit portable rail punches to be used for shop work.

Gulf Oil Corporation, Pittsburgh, Pa.—Mining lubricants.

Guyan Machinery Co., Logan W. Va.—GMC portable arc-welders.

Hercules Powder Co., Wilmington, Del.—Hercules permissible explosives—"Red H's" and "Hercoal" for lump, "Hercogels" for wet work, "Red H B" and "Collier C" for fine coal.

Jeffrey Mfg. Co., Columbus, Ohio—Jeffrey locomotive headlights, conveyor items and mining-machinery parts.

King Powder Co., Cincinnati, Ohio—The new "Red Crown Surface Sensitized" granular permissible explosive. Described as a more efficient permissible that gives the improved lump resulting from granular-powder action, the new product is said to have the following advantages: slow heaving and spreading action; cartridge packing for greater convenience; and the "most effective gas releases ever obtained with permissible explosives," resulting in greater spread, less effect on the roof, no pulverizing the hole, greater adaptability to mechanical-mining cycles, cleaner coal, more lump and less checking of coal. Additional features are an absence of nitroglycerin, eliminating freezing and headaches and reducing smoke and fumes.

A. Leschen & Sons Rope Co., St. Louis, Mo.—Leschen "Red-Strand" wire ropes for mining services.

Linde Air Products Co., New York—Welding and cutting torches, acetylene generators, acetylene and oxygen, Miner's Lamp "Union" carbide, acetylene floodlights, etc.

Link-Belt Co., Chicago—"P.I.V."-gear variable-speed transmission, other power-transmission items.

Macwhyte Co., Kenosha, Wis.—Wire ropes for all mining applications; Macwhyte braided wire-rope slings; and new swaged cable terminals, described as permanent end fastenings for mining- and loading-machine and scraper ropes.

Markham Products Co., Birmingham, Ala. Markham adjustable safety mine props (March, 1940, *Coal Age*, p. 93) in 24-, 30-, 36-, 42-, 48- and 60-in. standard heights and with various types of heads for caps, round and square bars, etc.

Metal & Thermit Corporation, New York—"Murex" electrodes for arc-welding, building up worn parts and hard-surfacing.

Mining Machine Parts, Inc., Cleveland, Ohio—New gear-type hydraulic pressure pump (May, 1940, *Coal Age*, p. 83), Timken-bearing mounted, made without gaskets, liners or packing and developing an operating pressure of 1,700 and a maximum pressure of 2,500 lb. per square inch; also improved underground mining-machinery parts and the "Dymonhard" line of hard-facing rods, for which the company stressed fusion with the base metal, rather than sweating on, with consequent increased resistance to shock. Either gas or arc application is possible.

A pore-free hard-facing on tool steel, hitherto difficult to secure, also was featured, along with No. 1 "Dymon-Arc" bronze rod, which can be applied in any position, including vertical and overhead, by the arc process and gives, it is stated, an unusually tough, hard and strong application; a mild-steel rod with self-peeling coating which automatically disappears in welding and thus eliminates cleaning, scaling, etc.; corrosion-resisting rods; and a manganese rod permitting hardness to be controlled during welding.

Nail City Bronze Co., Wheeling, W. Va.—"Hi-Led-Loy" non-freezing bearing bronze; high-tensile (exceeding steel) acid-resisting titanium-bronze; and a complete line of bronze parts for mining equipment.

National Carbide Corporation, New York—"National" carbide and lights.

Ohio Brass Co., Mansfield, Ohio—Locomotive headlights; arc-welders.

Osmose Wood Preserving Co. of America, Inc., Buffalo, N. Y.—"Osmose" process of wood preservation designed for use on green timber.

Penn Machine Co., Johnstown, Pa.—Repair parts for underground equipment; "Special-Alloy Non-Scoring Bronze" fully machined axle and journal liners, bushings and bearings for locomotives and mining machines; new-form "Strong-Tooth" hardened solid gears and armature pinions for locomotives; etc.

Post-Glover Electric Co., Cincinnati, Ohio—P-G space heaters employing P-G chromium-steel resistors and the new P-G resistance welder (Fig. 34) which uses a P-G chromium-steel resistor grid. It is available in six sizes, 40 to 300 amp., 250 volts. Safety is increased, the company notes, by elimination of switches and complete inclosure of current-carrying parts.

Pure Carbonic, Inc., New York—"Pureco" carbon dioxide.

Pure Oil Co., Chicago—Mining lubricants, including special products for extreme heat and cold.

John A. Roebling's Sons Co., Trenton, N. J.—"Blue Center" rope and wire products and fittings; welding electrodes and rods.

Shell Oil Co., St. Louis, Mo.—Oils and greases for mine use.

Socony-Vacuum Oil Co., Inc., New York—"Gargoyle" lubricants for mining and loading machines, etc.

Standard Oil Co. of Indiana, Chicago—Mining lubricants and lubricating services; "Stanolind" asphalts.

Stephens-Adamson Mfg. Co., Aurora, Ill.—"JFS" variable speed reducer; "Saco" speed reducer.

Sullivan Machinery Co., Michigan City, Ind.—"Sullivan" mining machinery parts; the new Sullivan WK-79 low-height mine-car compressor (Fig. 35) with a rated delivery of 85 c.f.m. Features include ball main bearings, "Micro-Lift" valves, forced-feed lubrication, variable track gage and "exclusive cupped-piston design for efficiency."

Sun Oil Co., Philadelphia, Pa.—Mining lubricants.

W. O. & M. W. Talcott, Inc., Providence, R. I.—Talcott belt fasteners.

Tamping Bag Co., Mt. Vernon, Ill.—"Seal-Tite" vibrating dummy maker and "Seal-Tite" safety-seam tamping bags, including a new fire-resistant type which can be charred but will not support flame, therefore promoting safety by reducing the possibility of igniting gas, coal, etc.

Templeton, Kenly & Co., Chicago—Complete line of jacks and tools for coal-cutting and loading machines, re-railing purposes and track work, timbering and roof support, car-straightening, post pulling, wire-stretching and conveyor tensioning, etc., including a new ratchet-operated armature puller adjust-

able over the usual range of armature sizes and also useful for small gears and pulleys; a new adjustable cutter-bar safety clamp with an auxiliary pulley to eliminate cutting of ropes in swinging bar; and the No. 522 5-ton tilting-base emergency jack—also available in 15-ton capacity—adaptable to simultaneous lifting and slewing.

An improved series of "Simplex" safety mine roof jacks with heat-treated steel screws and 50-per-cent-greater column strength was another company offering, along with the new No. 366 timber jack for lifting heavy beams and bars from a point near the floor to the roof. This jack (Fig. 36) eliminates high lifting and reduces the possibility of timbering injuries, it is stated.

Tide Water Associated Oil Co., New York—"Tycol" oils and greases.

Timken Roller Bearing Co., Canton, Ohio—Timken tapered roller bearings for mine cars, conveyors, etc.

Tool Steel Gear & Pinion Co., Cincinnati, Ohio—"Tool Steel" gears, pinions and replacement parts.

Bertrand P. Tracy Co., Pittsburgh, Pa.—Mining-machine and locomotive repair parts.

Union Wire Rope Corporation, Kansas City, Mo.—Various types of wire rope for mining use.

United States Rubber Co., New York—"U. S. Royal" tires.

Western Cartridge Co., East Alton, Ill.—Complete line of blasting caps and detonators of all types.

Wilson Welder & Metals Co., Inc., New York—Welding supplies, masks, etc., including Jackson insulated electrode holders; the new Wilson "Hornet" single-operator motor-generator welder (April, 1940, *Coal Age*, p. 131) with single handwheel control; and the Wilson "Wasp" 150-amp. arc-welder.

Wood Preserving Corporation, Pittsburgh, Pa.—Timber treatment with creosote and other products.

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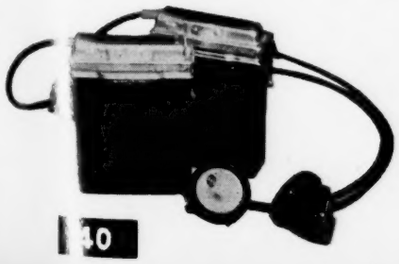


40

Materials for Safe Operation

Ventilating Aids

Advertising Displays, Inc., Covington, Ky.—"Tru-to-Life" animated safety messages regularly changed to insure continued appeal.

American Brattice Cloth Corporation, Warsaw, Ind.—Powder bags, battery pouches, brattice cloth, various grades of "Mine-Vent" ventilating tubing, Types A and B tubing suspensions and the new "Mine-Vent" tubing coupler (May, 1940, *Coal Age*, p. 84), described as a simplified demountable coupler. It uses solid rings and a split coupling, greatly simplifying installation, according to the company, while adjusting holes in the coupling permit changing the locking device to accommodate different thicknesses of tubing.

Bemis Bros. Bag. Co., St. Louis, Mo.—"Flexipipe" ventilating tubing with rope-seam suspension.

Brown-Fayro Co., Johnstown, Pa.—"Brownie" BC tubing blower.

John Flocker & Co., Pittsburgh, Pa.—The new "Moropa" cotton brattice cloth—a new type of cloth made of cotton and treated to render it fireproof and resistant to the different types of fungi found in coal mines. Flameproof and fungousproof characteristics are obtained, the company emphasizes, by the use of non-hygroscopic chemicals, with the result that the cloth is dry at all times, resulting in "decided direct and indirect savings as well as safety." Air loss, the company asserts, is 38 per cent less than with ordinary jute cloth at the same pressure and velocity, while the use of cotton and cross-weave construction greatly increases resistance to abrasion and tearing.

Jeffrey Mfg. Co., Columbus, Ohio—Type 8H-42 "Aerodyne" fan with adjustable blades; "Aerodyne Midget" 125-lb. tubing blower.

La-Del Conveyor & Mfg. Co., New Philadelphia, Ohio—La-Del-Troller propellor-type ventilating fans and portable tubing blowers.

Mine Safety Appliances Co., Pittsburgh, Pa.—Self-rescuers—individual protective breathing units in sealed canisters designed to be worn on the miner's belt ready for use in carbon monoxide, smoke or fumes following an explosion or during a mine fire; skid-type conveyor-rock-dusters weighing 175 lb. and delivering 35 lb. per minute; semi-portable skid or wheel-mounted rock-dusters delivering about 60 lb. per minute; trolley-wire guards; Bakelite explosives carriers; the 10-lb. M-S-A midget impinger for dust sampling for health purposes, plus microscopic dust-counting equipment and the M-S-A "Microprojector" for enlarging samples for easier reading; single-filter "Dustfoe" and "Comfo" dust respirators; eye protection; H-H inhalator; safety clothing, including "Comfo-Caps"; first-aid materials and the new M-S-A artificial-respiration trainer; the new M-S-A "Ear Defenders" to reduce the effects of noise in shops, etc.; the Edison Model "P" cap lamp and other electric cap and hand lamps, etc.

M-S-A also offered the new back-type one-hour oxygen apparatus (April, 1940, *Coal Age*, p. 131); the new telephone mask, in which a voice-powered telephone set is built into the facepiece of an M-S-A mask, permitting two-way conversation; new all-vision facepieces for the "All-Service" masks, giving much wider vision either sidewise or up and down; and a number of methane-detecting and recording instruments. Included in the latter was the new recorder (Fig. 37) for continuously recording and providing a visual indication of methane condition. The instrument may be equipped with relays for remote indication, sounding an alarm, cutting of mine power, etc.

A hand-size methane detector with pushbutton-type aspirator and palm strap for holding was another new M-S-A product. It is fitted with a permissible plug to an Edison cap-lamp battery. M-S-A also displayed a methane alarm operating off Edison cap-lamp batteries and fitted with either a light or a bell to indicate when a predetermined methane percentage is reached. Among other things, the unit may be hung in the working section to give a signal when the methane percentage rises. It also may be fitted with relay connections for remote indication or for shutting off power.

M-S-A also offered the "Foille" spray kit for burn treatment. Foille is a water-in-vegetable-oil emulsion for which the following advantages are noted: quicker emergency aid, marked control of pain and abatement of shock, reduced use of opiates and dressings, less nursing time, consistent control of sepsis, aid to more rapid epithelization, lessened occasion for contractures and reduced areas necessitating skin grafts.

Portable Lamp & Equipment Co., Pittsburgh, Pa.—Portable electric cap lamps and self-service automatic charging rack; "Cool Caps" and other pro-

tective clothing; first-aid material; other safety aids.

Safety First Supply Co., Pittsburgh, Pa.—Willson gas masks, respirators and "Super Tough" goggles for various mine and shop applications; sterilizer for first-aid rooms, etc.; asbestos sleeves for welders; other protective clothing; electric hand lamps for mine use, including an 85,000-cp. model; first-aid material and kits; welders' masks; the new E & J resuscitator, inhalator and aspirator, described as breathing machine which automatically adjusts itself to the lung capacity of the person being treated; and various types of light-weight aluminum ladders weighing, it is asserted, only half as much as the same ladders in other materials with twice the strength.

Tamping Bag Co., Mt. Vernon, Ill.—New reflector-button car markers, safety signs, direction markers, etc. (Fig. 38). These signals consist of reflector buttons in any desired color set in rubber matrices fitted with holes for screwing, riveting or nailing on steel, wood, etc., or which can be made up in the shape of arrows and the like. The reflector buttons are pushed into the matrices from the back and once the matrix is screwed down the buttons are difficult to pry out, thus checking loss. If a button is broken, the matrix is unscrewed and a new one inserted.

Watt Car & Wheel Co., Barnesville, Ohio—New rubber-covered powder box (Fig. 39) made of $\frac{1}{8}$-in. steel with $\frac{3}{16}$-in. rubber lining and $\frac{1}{8}$-in. outside cover vulcanized to the steel. It is available in any capacity, with the usual as 25 lb. The lid is arranged so that it cannot stay open of its own accord.

Wheat Lamp Sales, Inc., Pittsburgh, Pa.—Koehler flame safety lamps and Wheat electric cap lamps, including the new Model GW (Fig. 40), with a variety of beam patterns for various kinds of work where special lighting is advantageous. Features noted by the company include: 20 per cent more light, longer life, smaller and lighter headpiece, variety of beams, an auxiliary "standby" bulb providing ample working light if necessary, fewer parts with "unit-sealed" construction, adaptable to any charging system, uniform shadowless beam, adaptable to self-service in the lamp house, and no opening or disconnecting to charge.

Also demonstrated was the new self-contained self-regulating charging system with new Wheat unit control. Each charging post is supplied with its own rectifier, which is easily replaceable and requires no adjustments or expert attendance, it is asserted. To charge, a keyhole in the back of the headpiece is slipped over a key on the charging rack and the headpiece is given a half turn to start the charge. To take the lamp off, the operation is reversed.

Mine Pumps and Accessories Pipe and Valves

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—*Centrifugal pumping units, in*cluding the "SSU" small-sized close-coupled pump for mine service.

Bowdil Co., Canton, Ohio—Bowdil "Orbit" valves, operating on the ball-and-socket principle and providing a full-sized pipe passage when open. The wedge action of the stem, it is stated, insures a perfect seal when the valve is closed, while the design makes it self-cleaning; also applicable to steam and air.

Brown-Fayro Co., Johnstown, Pa.—Foot and check valves, strainers and other drainage accessories.

Deming Co., Salem, Ohio—Fig. 1896 "Oil-Rite" 5x5 gathering pump with flat or ball valves, replaceable cylinder liner, Timken bearings, helical gears and stainless-steel piston rods as standard equipment; 21-in. $\frac{1}{4}$-hp. 10- to 45-g.p.m. 60-lb.-weight sump pump for use in low coal, in conveyor-mining sections, with water cars, etc.—can be furnished with 250-volt explosion-proof motor; Deming-Mueller deepwell turbine pumps; and "Duraloy" acid-resisting parts.

Flood City Brass & Electric Co., Johnstown, Pa.—Pump impellers, foot valves and other accessories.

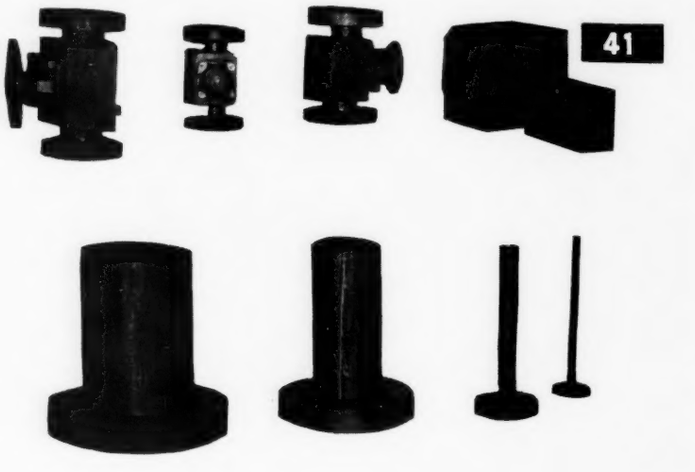
Gorman-Rupp Co., Mansfield, Ohio—Centrifugal-type mine gathering pumps with demonstration of self-priming characteristics; iron, anti-acid-bronze and chromium water ends for various water conditions; portable gasoline-driven pumps of the same type; small unit-type $\frac{1}{2}$-hp. centrifugal pump, 70 g.p.m. for use on water boxes, etc.

National Carbon Co., Inc., Cleveland, Ohio—"Karbate" impervious corrosion-resisting pipe and fittings and "Karbate" valves for acid mine water and other corrosive materials. Both the pipe and valves (Fig. 41) are available for average pressures. The pipe, the company states, is light in weight and has high resistance to thermal shock, good electrical conductivity and good mechanical strength. Fittings include threaded sleeve couplings, cemented and threaded flange couplings, threaded block elbows, block return bends, threaded block tees and threaded sweep elbows and return bends. "Karbate" valves, of the Saunders type, permit making the piping system entirely of "Karbate." All parts are made of "Karbate" except the flexible diaphragm, which is furnished in rubber or "Neoprene."

National Tube Co. (subsidiary United States Steel Corporation), Pittsburgh, Pa.—Copper-steel "Duroline" pipe, copper-steel pipe and other tubular products.

Post-Glover Electric Co., Cincinnati, Ohio—"Universal" cast-iron pipe.

Sterling Pump Corporation, Hamilton, Ohio—Sterling deepwell turbine, impeller and centrifugal pumps.



POWDER COST CUT

By Shooting Revisions at Talleydale To Raise Coarse-Coal Yield and Loadability

A substantial reduction in powder use, bringing cost down to 2 to 2½c. per ton, an increase of 10 per cent in coarse-coal yield and rising loading-machine output have followed revisions in shooting and face-preparation methods at Talleydale mine. These results have been accomplished despite difficult natural conditions, and in large part were due to making face bosses responsible for good shooting.

By IVAN A. GIVEN
Associate Editor, Coal Age

WITH a difficult shooting problem, the management of the Snow Hill Coal Corporation has succeeded in cutting materially the cost of explosives and supplies at the Talleydale mine, Terre Haute, Ind., at the same increasing coarse-coal yield and easing conditions for the loading machines. This has been accomplished, as one official put it, "by using horse sense instead of powder," and involved changes in explosive types, a careful investigation into drilling patterns, placing the responsibility for good shooting on the face bosses instead of the night men, and education of these bosses, plus cutters, drillers, bug-dusters, and shotfirers, in the proper use of explosives under Talleydale conditions.

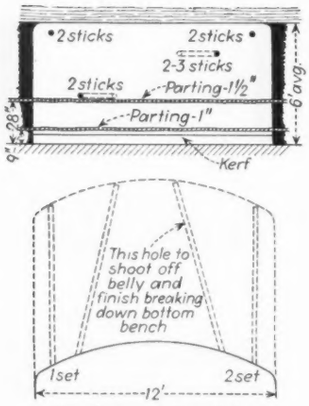
Talleydale recovers the Indiana No. 3 seam, generally averaging 6 ft. in thickness. Some 9 in. above the bottom is a 1-in. parting, with a second 1½-in. parting about 28 in. above the floor. Other bands and partings cut in and out, and sulphur lenses and sheets of various sizes and thicknesses are frequent. As many as 27 lenses have been counted in one 24- to 26-ft. face. This indicates the difficulties which might be expected in shooting. Cutting is done on the bottom with track-mounted machines equipped with 8- and 9-ft. bars. Heat-treated bits are employed to make a 6-in. kerf. The entire seam is mined and the coal is placed in 6-ton mine cars by track-mounted loading machines.

Talleydale was acquired by Snow Hill in 1934, and before being reopened was equipped with a new hoisting shaft and mechanical preparation plant. Shooting to obtain a reasonable yield of coarse sizes and also to give the loading machines a fairly good chance was a difficult problem from the start. The first explosive was a slow Monobel in 1¾ x 6-in. sticks. Then, to obtain better loadability, a change was made to Monobel 11, a faster powder, in 1¾ x 6- and 1¾ x 8-in. sticks. With the change, cushion shooting was tried, along with snubbing shots, snubbing pans, and other suggestions for getting a loose fall of coal and more coarse coal with less powder.

Early in 1938, du Pont Lump Coal C in 1¾x6-in. sticks was adopted and was loaded solid in full-depth holes. Almost immediately, the Snow Hill management asked for the same powder in 2 x 6- and 2 x 12-in. sticks for greater convenience in adjusting the quantity per charge. Also, the diameter permitted the company to follow out its idea of using a large stick to get as much force as possible at the back of the cut to assist in rolling out the coal.

By this time, the changes in powder and shooting methods had begun to yield results in a reduction in explosives cost, although it still was necessary to break the coal up pretty fine to enable the loading machines to pick it up without undue difficulty. And, with the market conditions of 1938, a higher yield of coarse coal was extremely desirable. With the explosive finally selected, officials believed they had a good shooting medium for their conditions. However, they were not so sure they had exhausted possibilities in other directions, so in June, 1939, a careful study of methods of placing powder, along with the other factors entering into face preparation, was initiated.

The first step was explaining the purpose of the investigation to the face bosses and the cutters, drillers, bug-dusters, shotfirers and other men engaged in face preparation. This explanation made plain just how better shooting, in turn increasing loading-machine output and raising the yield of coarse coal, would affect sales and working time. Suggestions were asked from all concerned and were given actual trials. In these trials, the face bosses played an important part. In other words, after their regular day shift, or on an idle day, they gathered in a section and did the cutting, drilling, loading of holes and shooting. Thus, they got first-hand information on what the problems were and how the suggestions turned out. Therefore, when they eventually were made responsible for the condition of the coal they had to load, they were able to pass their knowledge on to the face-preparation men on the night shift.



Heading with Four Holes--
Normal Shooting
20-25 tons cut 7½' or 8½' deep

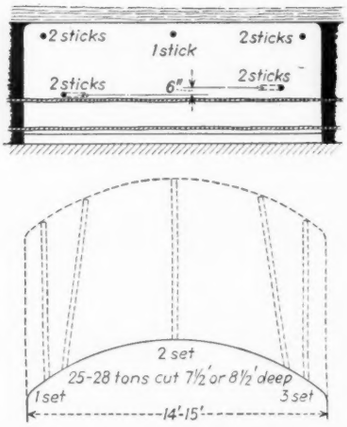
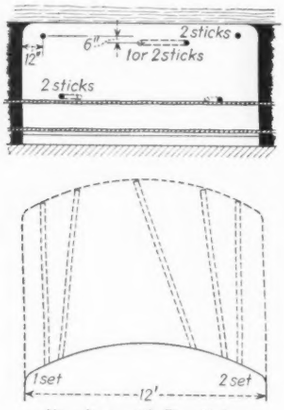


Fig. 2—Drilling pattern and hole loading, 14- to 15-ft. room necks, Talleydale mine.



Heading with Five Holes--
Hard Shooting

Fig. 1—Drilling patterns using four and five holes in a face in headings, Talleydale mine, showing also usual charges per hole.

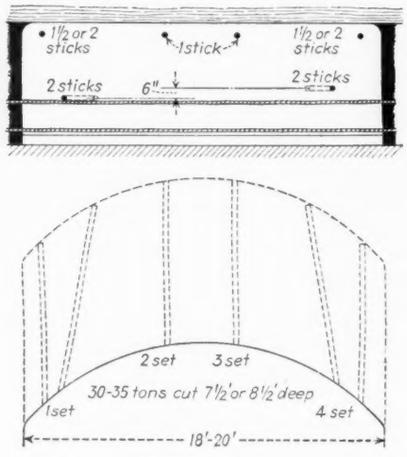


Fig. 3—Drilling pattern and hole loading, 18- to 20-ft. places, Talleydale mine.

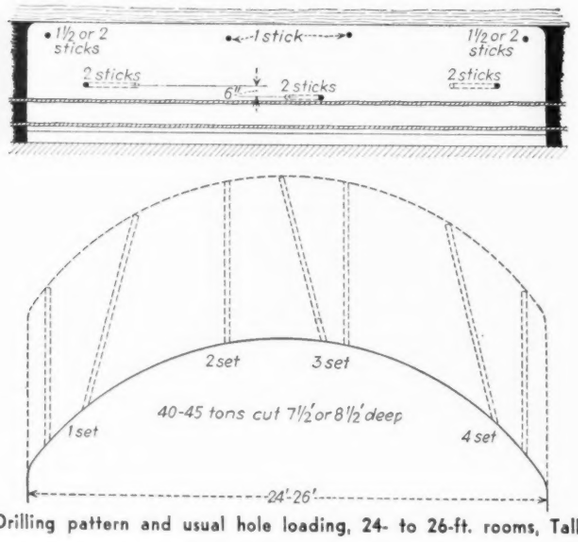


Fig. 4—Drilling pattern and usual hole loading, 24- to 26-ft. rooms, Talleydale

This one step—placing the responsibility on the face bosses instead of the night men—is credited by the management with a large part of the resultant improvement. Equally important, in the opinion of the management, was the educational work which accompanied the trials. Knowing what the goal was and how it would affect them, and with a definite reason for each step taken, both face-preparation men and bosses were able to work together much better to achieve the desired results. Now, when bad loading is encountered, the face boss goes back at night and works with the preparation men until its is corrected, usually in short order.

Along with these other things, the mine trials, under the direction of Fred Bieler, mine manager, also culminated in a shooting plan which greatly reduced powder consumption and increased coarse-coal yield. One of the first ideas tried was short snubbing holes. However, it was found that these did not pull the coal at the back and left too much of a burden on the top holes. So drilling to the full depth was resumed.

Breaker Shots Changed

Due to the presence of the partings in the bottom of the seam, breaker shots must be used to crack them and throw the lower bench down. Until that time, both of the two breaker shots usually required were drilled just over the top parting. With the thin bottom bench and the deep cut, these holes had a tendency to pop through at the back without doing much work from the standpoint of bringing down the coal. So it was decided to move all but one of the holes up some 6 in. (more in one case, as detailed below), leaving the other in place to break the partings, after which the upper hole, or holes in the widest places, with 6 in. or so more coal to work on, would pull well to the front. With the bottom holes properly placed, the top ones then were drilled in conventional fashion: i.e., one on each rib and generally equally spaced across the face.

In developing the drilling pattern, the principles of solid shooting were followed as far as possible. In other words, each shot was placed with the idea of getting the coal out of the way for the next and thus letting it do its full duty with a minimum powder charge. It followed, also, that shots must be fired in turn, as firing a group at once would nullify the relieving action sought by one-by-one firing.

Headings 12 ft. wide and making 20 to 25 tons of raw coal now are shot with four holes under normal conditions. These holes are drilled from two drill set-ups, using post-mounted equipment, with the one breaker hole 2½ ft. from the rib and just over the top parting. A second "lifting" hole is put in from the opposite side about on a line between the breaker hole and the opposite top rib hole. This hole finishes breaking down the bottom bench and also eliminates humps on the face.

Where shooting is unusually difficult, five holes are put in a heading face as in Fig. 1. Two are drilled over the top parting (both on the parting in this case), two in the top on each rib and one in the top center about 6 in. below the rib holes. A four-hole place is shot with the equivalent of eight to nine 2 x 6-in. sticks of Lump Coal C, with the same in a five-hole place, although distribution is slightly different, as indicated in Fig. 1. In the old days, a heading was shot with four holes, two just over the top parting. Normal hole loading was four sticks, or about sixteen sticks per place.

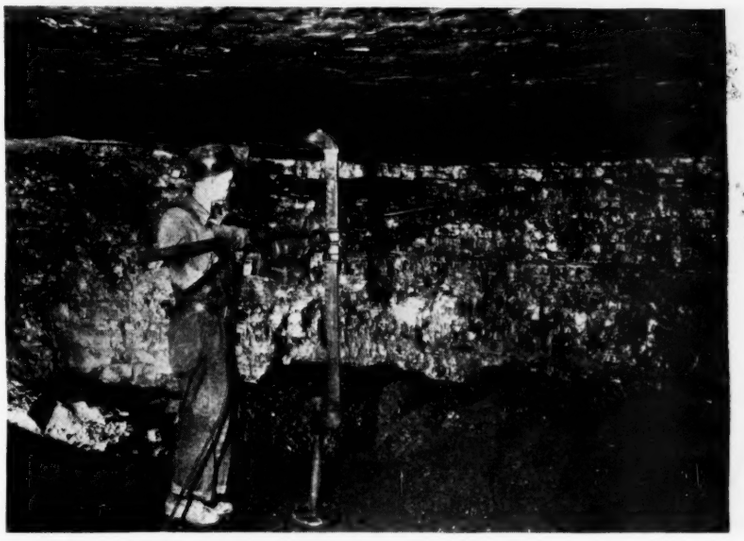
One Hole a Breaker

Drilling patterns for rooms in various stages of widening are given in Figs. 2, 3 and 4. Holes number, respectively, five, six and seven. In each case, however, one is a breaker just over the top parting, with a lifter some 6 in. higher on the opposite side, except in the widest places, where the breaker is drilled in the center with a lifter on each side. Powder used varies from the equivalent of nine sticks in a room neck up to eleven or twelve sticks in the maximum width of 24 to 26 ft.

Shotfirers are not given much leeway in increasing the quantity in a place, and use of more than twelve sticks in the widest places brings an immediate investigation, as the trials proved that the coal could be shot with less powder than formerly was thought necessary when the proper methods are used. Although there are exceptions, excessive powder usually is a signal that the system decided on is not being followed. One result of the lighter charge per hole was a reduction in shock to the roof, with resultant improvement in its condition.

Comparing powder consumption in a 24- to 26-ft.-wide place shows that under the old system, using six holes, two over the parting and four in the top, twenty sticks were required to bring down 40 to 45 tons of coal. Under the new system, normal powder requirements (seven holes) are eleven or twelve sticks. At the same time, loadability in increased, coarse-coal percentage is raised and shock to the top is reduced. Now, the breaker shot and the two lifters bring down about two cars of coal, with the top holes getting the remainder. And under the new plan, gripping in cutting, with consequent wedging in the corners, is prohibited; thorough bug-dusting is insisted upon; and shots are fired one at a time.

Results include a change of approximately 10 per cent in yield of plus 1¼-in. coal, along with a steady rise in loading-machine output, due in large measure to easier loading. Tons of raw coal per pound of powder has risen to close to 6 (5.8 for October and November, 1939). At the same time, the cost of explosives and supplies, which was 5.08c. per ton in 1937 and 5.95c. in 1938, has dropped to 4.89c. for the first 11 months of 1939 (powder, 3.07c.; caps, tamping bags, battery and cable maintenance, etc., 1.82c.). Since June, 1939, powder cost has been around 2 to 2½c. per ton. As an example, the December powder cost was 2.44c., compared with 4.35c. in January, 1939.

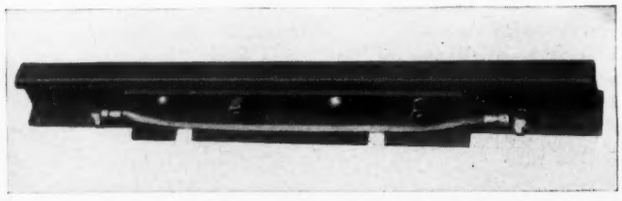


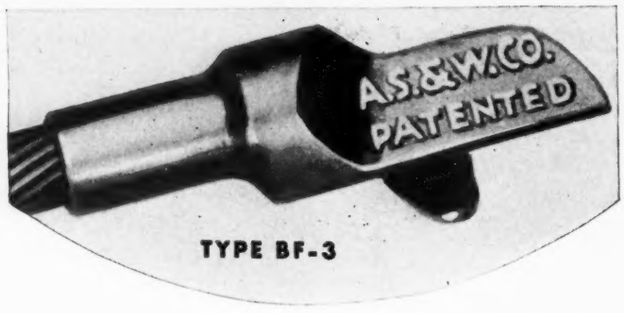
Part of a room face in Talleydale showing, near the bottom, the two characteristic partings and also the usual occurrence of sulphur lenses.

An average fall of coal in a room after part has been loaded. A good roll was secured, while coal still standing in the face is loose. Coarse-coal percentage is good for Talleydale conditions.

WELDERS AGREE ON THE BF-3

A power bond designed by Welders for Welders





TYPE BF-3

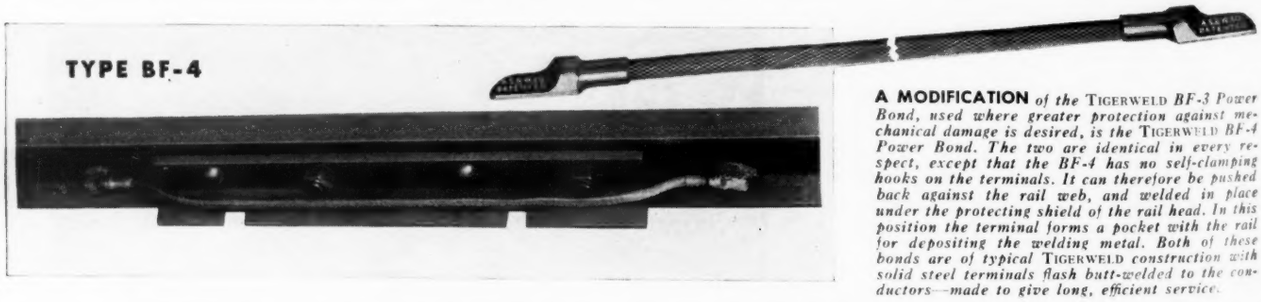
WELDERS told us what they wanted — a power bond that would install easily and quickly, one that would require no special skill to produce effective, trouble-free bonding.

And so the TIGERWELD BF-3 was designed, to simplify in every possible way the job of welding it to the rail.

This bond's terminal is formed into a sloping surface, at just the right angle for easy welding. No clamps are required to hold it in position. Self-clamping hooks are provided on the terminals. You merely tap the terminal on the rail base with a hammer, and there it stays, tight and steady until the weld is finished.

Welders helped design this bond—that's why welders everywhere prefer it. If you aren't already using the BF-3 to complete your power circuits, give it a try. And then, don't take our word for it—ask the welders. They'll tell you it helps them turn in a better bonding job in less time than ever before.

TYPE BF-4



A MODIFICATION *of the* TIGERWELD *BF-3 Power Bond, used where greater protection against mechanical damage is desired, is the* TIGERWELD *BF-4 Power Bond. The two are identical in every respect, except that the BF-4 has no self-clamping hooks on the terminals. It can therefore be pushed back against the rail web, and welded in place under the protecting shield of the rail head. In this position the terminal forms a pocket with the rail for depositing the welding metal. Both of these bonds are of typical* TIGERWELD *construction with solid steel terminals flash butt-welded to the conductors—made to give long, efficient service.*

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

For Anthracite Service: Miners Bank Building, Wilkes-Barre, Pa.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

WHAT'S NEW IN OPERATING IDEAS

Miners' Exhibit at Cincinnati Meeting Brings Kinks From All Over

WITH entries ranging from loading-machine safety devices to sand and grease buckets, the Miners' Exhibit at the 17th Annual Convention and Exposition of the American Mining Congress, Cincinnati, Ohio, April 29-May 3, brought prizes to ten participants. The exhibit was in charge of a committee headed by A. W. Hesse, chief engineer, Buckeye Coal Co., Nemacolin, Pa. Brief descriptions of the prize-winning kinks follow.

A full-sized dummy-filling machine was demonstrated by Fred M. Kilfoyle, master mechanic, Spring Canyon Coal Co., Spring Canyon, Utah. The filling material, such as clay, sand, rock dust, etc., is placed in a vibrating hopper, from which it is fed by gravity into filling tubes. Pedals (Fig. 1) are used for releasing the bag clamps. With a four-tube machine it was stated that one man can fill an average of 400 to 500 dummies an hour. The motor and ball-bearing drive, operating in oil and protected from dust by packing glands, are housed in a cabinet 25x33 in. by 39 in. high. The vibrating hopper measures 17x28 in. and is 10 in. high. Weight of the complete machine is 325 lb.

An operator protector for an 8-BU loading machine was shown by the Harwick Coal & Coke Co., Harwick, Pa. This consists of a double-hinged telescopic feeler attached to the machine just ahead of the operator's position (Fig. 2), which cuts off the power when it touches the rib, a timber or other obstruction. Thus, the loading machine is prevented from moving ahead and possibly crushing the operator. A telescopic end section, together with the hinged mounting, prevents breakage of the device itself.

A combination sand scoop, carrying bucket and funnel for filling locomotive sand boxes won a prize for Jesse Farley, West Virginia Coal & Coke Corporation, Omar, W. Va. The device is featured by a cone-shaped screen and a cone-shaped valve, with the latter operated by a trigger pulled by a finger of the hand holding the bucket (Fig. 3).

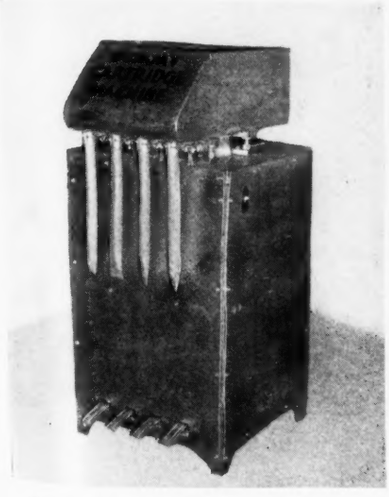
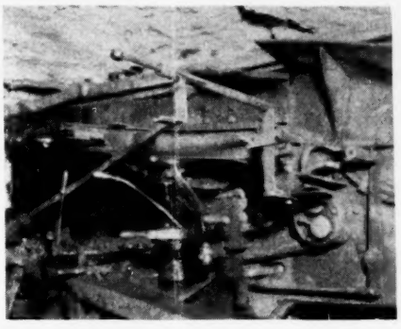


Fig. 1—Kilfoyle dummy-filling machine.



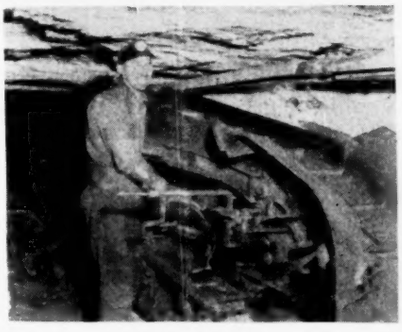


Fig. 2—Showing the hinged telescopic feeler which cuts power off the loading machine at the Harwick Coal & Coke Co.

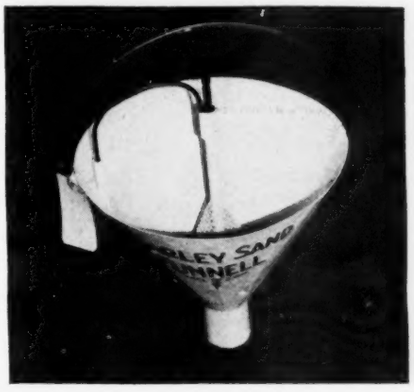


Fig. 3—Farley combination sand scoop and funnel.

Fig. 4—Thomas automatic-locking drill chuck.

A "new patent safety automatic locking drill chuck" (Fig. 4) was displayed by Noah Thomas, assistant mine foreman, Isabella (Pa.) mine, Weirton Coal Co. It is designed to do away with the hazard often introduced when protruding pins or spikes are used to lock a drill in the chuck. A knurled-finish sleeve which turns with the drill forces a drill-locking pin in and out by the action of a spiral groove. A forward half turn of the sleeve pulls the pin to release the drill.

The concrete-filled socket for electric-cable suspension offered by H. J. Kinsman, maintenance engineer, Franklin County Coal Corporation, Inc., Herrin, Ill., was accompanied by photos showing an installation made in 1921, supplemented by a 1935 job consisting of a 1,500,000-circ.mil concentric d.c. cable in a borehole 370 ft. deep. With either a spiral-wire-armored cable or a concentric d.c. cable in which the grounded conductor serves as the sheath, the suspension consists of a few feet of pipe, or casing, into which the cable is anchored by a filling of concrete. This type of sealed suspension is used for outside boreholes in addition to holes terminating inside substation buildings.

An automatic shaft-guide lubricator brought a prize to Peter P. Kuncis, Boulder Valley Coal Co., Lafayette, Colo. The lubricator (Fig. 5) consists of an oil tank with gage, the necessary tubing to the points of oil application on the guides and a vane and valve mechanism for releasing the oil. The lubricator is set on a bunton near the top of the shaft. Passage of the cage causes sufficient air movement each time to operate the vane and open the outlet valves for a moment.

The safety coupling for locomotives shown by D. R. Richardson, Union Collieries Co., New Kensington, Pa., includes an L-shaped pin: i.e., a pin bent over on the top to form a hand lever. The link (Fig. 6) is cut from solid steel with the usual oblong hole for about three-fourths of its length, supplemented at the other end by a square hole. That part of the pin fitting in the square

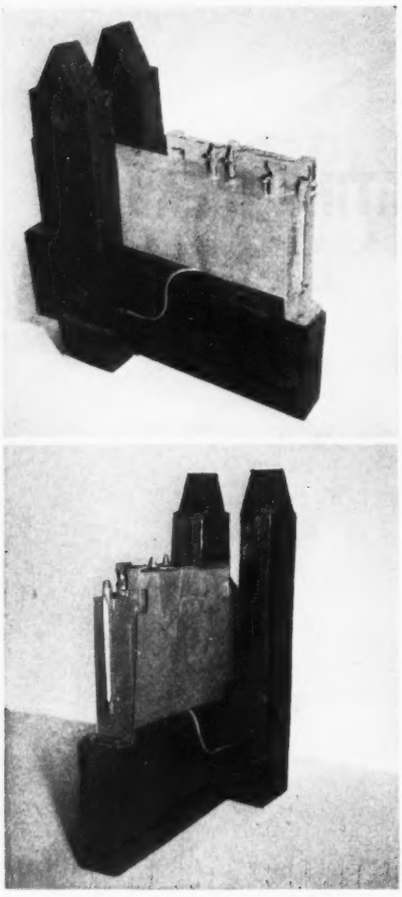


Fig. 5—Kuncis automatic guide lubricator, showing, in the lower view, the movable vane which releases the oil.

hole also is square, which permits the operator to rotate the link to coupling position by means of the pin handle, which is up in a safe position.

Keeping grease free from dirt and also facilitating drawing it off in either quantities or small dabs are features of the grease bucket shown by E. L. Swanson, Colony Coal Co., Dines, Wyo. A large, short spout on one side near the bottom (Fig. 7) is fitted with a threaded cap. The grease is covered with a packed piston forced down by a screw.

Allen Ewing, track foreman, Dawson Daylight Coal Co., Dawson Springs, Ky., used a model (Fig. 8) to show his fixed rerailer, which is installed near the bottom, at the approach to the dump or other logical point. It serves both rails and thus can rerail cars regardless of the side on which they are off or the direction of travel of the trip.

Photographs were used by J. H. Kuehner and A. D. Neal, Jefferson No. 20 mine, Consolidated Coal Co., Nason, Ill., to show the operation of the turntable charging rack used with rubber-tired haulage at this property. A chain hoist on an I-beam trolley deposits a battery on one side of the round table, or rack (Fig. 9), which then is rotated to bring a new space around to receive another battery from the same hoist position.

The other entries in the Miners' Exhibit included the following:

Solenoid mine-door release to enable the motorman to close the door from a remote point—F. E. Schroyer, Cherry Tree Coal Co., Emigh, Pa.

Wood-and-steel stretcher with special provisions for good strapping—Red Parrot Coal Co., Prenter, Pa.

Jigs used in the manufacture of switch points by flame cutting (*Coal Age*, October, 1939, p. 70)—John Mays, Consolidated Coal Co., Herrin, Ill.

Underground battery-powered rubber-tired supply truck weighing 5,000 lb. with battery, operating at 6 m.p.h., turning on a 9-ft. radius and having a capacity of 3,000 lb.—A. H. Wagoner, master mechanic, Consolidated Coal Co., Nason, Ill.

Hinged shield which can be raised in front of motormen serving loading machines to protect them against flying coal when lumps are broken against the roof—Hector Hall, chief electrician, Zeigler (Ill.) No. 2 mine, Bell & Zoller Coal & Mining Co.

Semi-continuous dewatering unit employing hydraulic pressure—James L. Davidson, Birmingham, Ala.

Portable one-latch turnout—Harry Barlow, Gary, W. Va.

Suction strainer for low coal built lengthwise into a short length of pipe—George Taylor, Sr., Chippewa Coal Co., Saginaw, Mich.

Barton safety car stop—A. Fred Phelps, Pardee & Curtin Lumber Co., Bergoo, W. Va.

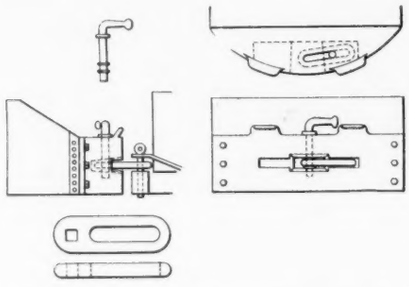


Fig. 6—Details of the Richardson safety coupling for locomotives.

Shin guards, including flap over instep—Van B. Stith, Anchor Coal Co., Highcoal, W. Va.

Welded mine-car skid—W. F. Wright, Virginia Iron, Coal & Coke Co., Toms Creek, Va.

Rail connector for extending track at the face in both hand and mechanical loading—Peter Troski and K. V. Witten, Pocahontas Fuel Co.

Drill socket on which the knurled sleeve is loose and does not rotate with the auger—T. E. Davies, Buckeye Coal Co., Nemacolin, Pa.

Ball-bearing puller comprising bolts with heads ground off on one side which are inserted between the balls—G. B. Clayton, Midland Electric Coal Corporation, Farmington, Ill.

Car stop consisting of curved terminal rail—G. F. Ballengee, Wayne Coal Co.

Blasting-cable reel; terminals for connecting battery on side normally keep the cable shorted—G. L. Tolliver, Gulf Smokeless Coal Co.

Car stop consisting of a metal clevis placed around the rail plus a wooden wedge—E. N. Andrews, Barnes & Tucker Co., Barnesboro, Pa.

Now's the Time

Kinks for reducing cost, increasing efficiency and promoting safety are being developed every day by operating, electrical, mechanical and safety men at the mines. No doubt you have one yourself. If so, you can cash in on it in these pages. So fix it up and send it in. Just use your own words and include a sketch or photo if it will help to make the idea clearer. Now's the time, so don't delay. For each acceptable idea, Coal Age pays $5 or more on publication.

Ground clamp with large wing-nut screw—John Gill, Barnes & Tucker Co., Barnesboro, Pa.

Trip stopper for use on locomotive; anchor pins through bumper drop down between ties—Reuben West, Barnes & Tucker Co., Barnesboro, Pa.

Portable car rerailer, comprising stand with a socket and a lever with a king pin and hook so that a car end can be lifted and swung back to the rails—J. W. King, Youngstown Sheet & Tube Co.

Shaker-conveyor-discharge extension pan; by loosening setscrews on clamps length of discharge can be varied from 7 to 12½ ft.—E. L. Swanson, Colony Coal Co., Dines, Wyo.

Latch-plate for turnouts used in mechanical mining; depressible inverted-V spring holds switch points in position when no stand is used—D. R. Richardson, Union Collieries Co., New Kensington, Pa.

Electrically insulated explosives car—Koppers Coal Co., Grant Town, W. Va.

Portable equipment used on mechanical-loading sections: (a) two fire extinguishers on a jack pipe; (b) permissible junction box on a double-pipe jack frame; (c) stretcher board also serving a splint for most bone breaks; (d) first-aid kit on a double-pipe jack frame—Koppers Coal Co., Grant Town, W. Va.

Conveyor-pan saddle, supporting any shaker pan from roof or floor and assuring

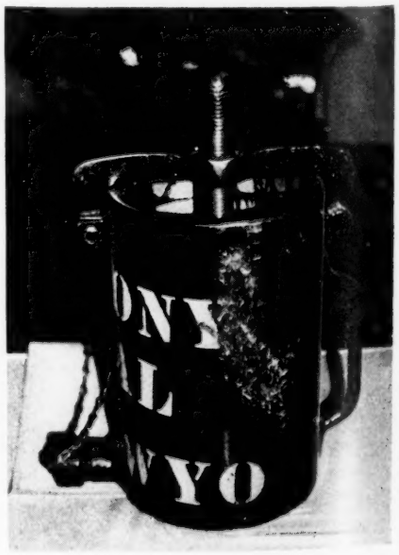
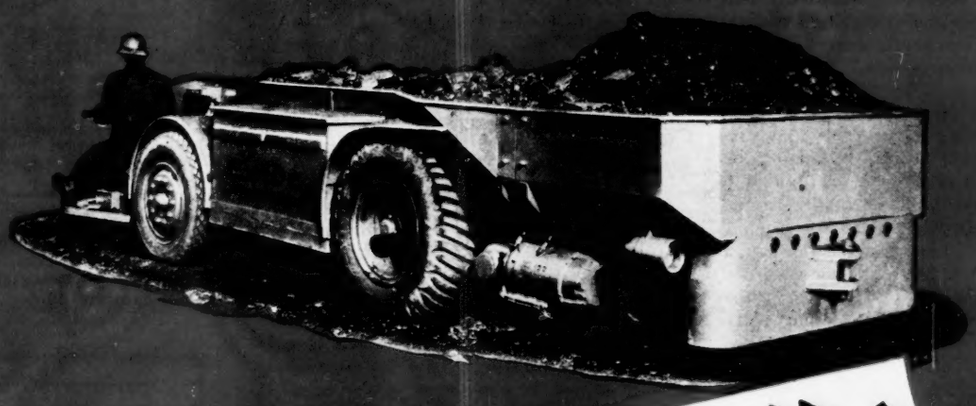


Fig. 7—Swanson grease bucket.

MINE HAULAGE ON *Rubber Tires* . . .



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Exide IRONCLAD BATTERIES
With Exide MIPOR Separators
"MIPOR," Reg. U. S. Pat. Off.

THE use of rubber-tired haulage has put a check on rising production costs in many mines. Records show that total working time has often been doubled, while delays have diminished. Some of this saving is due to a reduction in time lost in making car changes. And some of it is due to the speedy, powerful and dependable performance of shuttle cars and tractors when powered by Exide-Ironclad Batteries.

These batteries help you obtain the utmost from your haulage equipment, whether you use a shuttle car, a tractor-trailer, or a locomotive. Exide-Ironclads are dependable. When power is needed they deliver it—in a great surge, if necessary, for exceptional loads and grades. They maintain a good voltage—which means good haulage speed—morning and afternoon alike. They need so little attention and live so long that they keep haulage cost down to a minimum.

These are the reasons why more Exide-Ironclads are used in underground haulage than all other batteries combined. Write today for new, free booklet, "Mine Haulage on Rubber Tires."

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

maximum headroom and clearance—E. L. Swanson, Colony Coal Co., Dines, Wyo.

Pick-and-shovel holder for conveyor and pit-car-loader crews; designed for two picks and two shovels—W. C. Thompson and A. J. Logan, New River Co., Cranberry, W. Va.

Pipe handler to facilitate laying or removing large-diameter pipe in sections where no track is available—W. H. Berguns and Zernie Campbell, New River Co., Cranberry, W. Va.

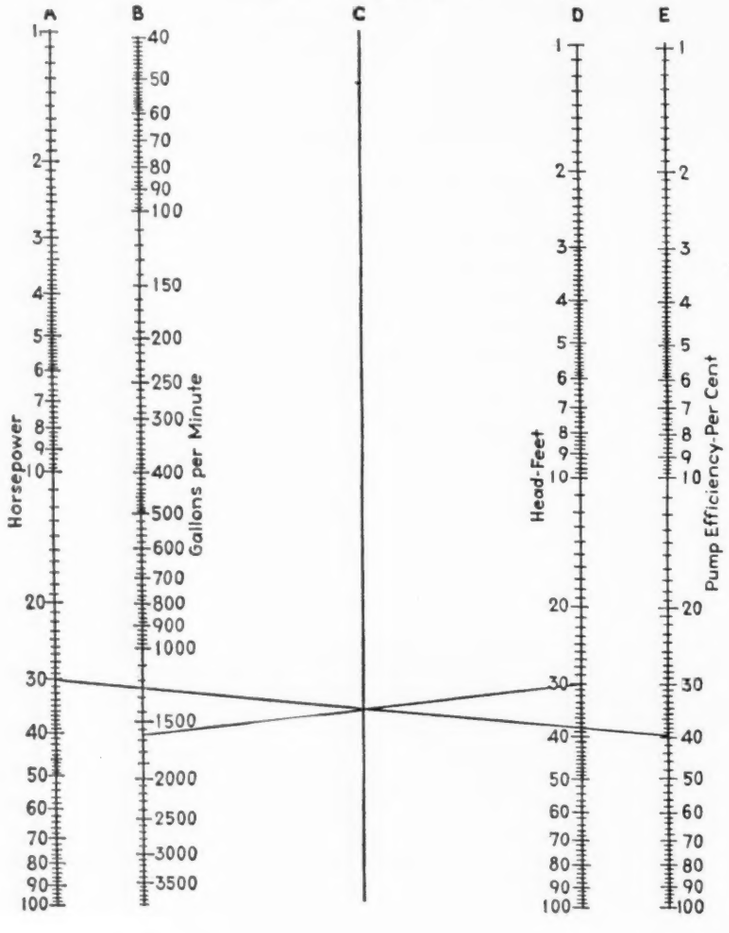
•

Determining Pump Data Aided by Chart

"A ready and reasonably accurate means of determining power, capacity and efficiencies of pumps is frequently desired by engineers and maintenance men," states P. C. Ziemke, Milwaukee, Wis. "This chart will be found useful in calculating the horsepower up to 100 necessary to perform practically any pumping task, in estimating the gallons-per-minute capacity of a given unit, in determining the head, or in finding the efficiency of an installation. As an example, we may have a 30-hp. motor operating a pump with a 40-ft. head and an efficiency of 30 per cent. We proceed by joining the figure 30 in the horsepower column (*A*) with 40 in the per cent column (*E*). Then locate the intersection with Column *C*. Next run a straight line through that intersection and the 30-ft. head (Column *D*). The answer, 1,600 g.p.m., is read in Column *B*.

"One must bear in mind that *A* and *E* must be connected, also *B* and *D*. The two outer columns are used together and *B* and *D* are used together. Now, knowing the values of *A*, *B*, *D* or *E*, the fourth is easily arrived at without computation. When efficiencies are computed, an allowance of 80 per cent must be made for duplex, triplex and reciprocating pumps; for late models of centrifugal pumps, about 58 per cent. For air-lift models, 38 per cent is a fair estimate. Obviously better efficiencies than these quoted are obtainable with the models listed. The figures listed herein merely represent an average. When the *exact* efficiency of a given unit is known, that figure, of course, is to be used in conjunction with this chart. Motive power makes no difference."

Facilitates securing pump data.



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Cable Life Can Be Increased By Proper Use of Data

"The capacity of portable rubber cables depends on the resistivity of the rubber insulating jacket to heat," writes Fred W. Richart, Carterville, Ill. "Cables usually are rated at 60 deg. C. for the copper, and most tables are based on that figure. And 60 deg. C. means 140 deg. F., which is a rather narrow margin of rise for outdoor summer service in some parts of the country. Most users are aware that special 75-deg. C. cable is available for unusual conditions.

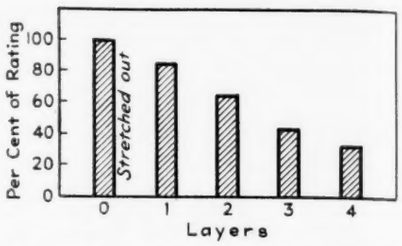


Fig. 1—Effect of layers on reel on portable-cable rating.

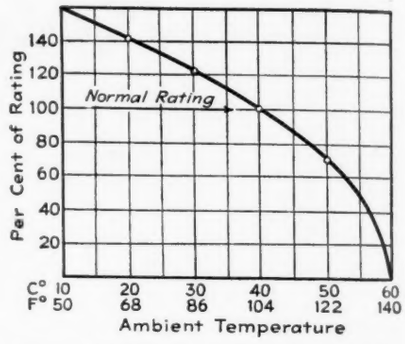


Fig. 2—Effect of air temperature on portable-cable capacity, 60-deg. C. copper.

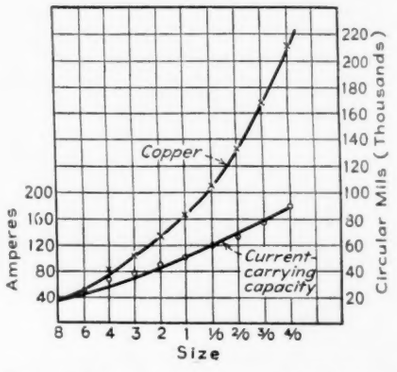


Fig. 3—Current-carrying capacity vs. copper, 3-conductor 5,000-volt portable cables.

"Cable manufacturers have prepared rules and tables by which the safe carrying capacity may be determined readily under varying conditions. This information is available for the asking and most users are aware that it is important. Yet it is doubtful whether users, generally, appreciate the results of applying these rules literally.

"Size of conductors and multiple layers on reels have a great effect on the usefulness of the copper in the cable. Doubling the cross section of copper does not double the current-carrying capacity of the conductor, for it only increases the heat radiating area by a mere 15 or 20 per cent. Multiple layers on a reel soon bring useful capacity to near zero because heat cannot be dissipated.

"On the mechanical side, the minimum allowable radius of curvature is twelve times the diameter of the cable. To subject a portable cable to shorter curvature nullifies the manufacturer's guarantee.

Numerous cases of cable failure can be traced to small-diameter reels and to careless kinking in handling. Designers of equipment have been impressed and the trend is to larger-diameter reels. However, there is yet room for improvement.

"Oxygen-free copper, which the purchaser can get, should materially increase cable life from the mechanical viewpoint. Information from copper-wire manufacturers indicates that oxygen-free copper will withstand about four times the bending of ordinary wire before failure. If there is any extra cost at all it is small.

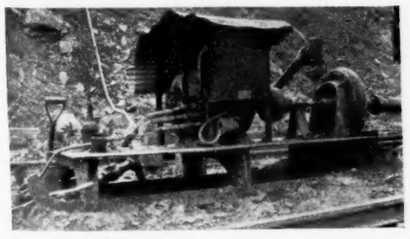
"Diagrams and curves bring these characteristics of cables more forcibly to mind than do statistical tables. Fig. 1 shows, impressively, the effect of piling up cable on a reel. Even a single layer reduces carrying capacity 15 per cent. Fig. 2 demonstrates the great variation in cable capacity due to surrounding temperature, 140 deg. being the absolute limit for standard rubber. Fig. 3 indicates the rapid approach of very large multiple-conductor cables to the point of commercial extravagance.

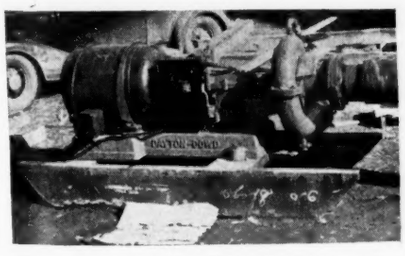
"For a given application all these factors should be considered in determining the conditions and size of cable that will give the greatest dollar value. It is a problem that has been given too little thought."

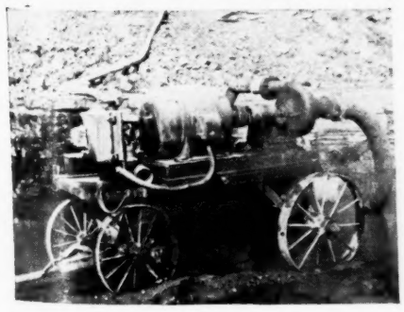
•

Strip-Pit Pump Requirements For Efficient Dewatering

Little water seeps into a strip pit from the overburden, Fred W. Richart, special contributor, Carterville, Ill., points out, and only a small pump is required to take care of it. Usually a 10-hp. motor-driven centrifugal pump will be sufficient and also will remove water from slight rainfalls. Like most other strip-mine equipment, it is made portable by mounting it on a sled or truck.







Strip-pit pumps made portable.

"The speed of small pumps should be 1,200 or 1,800 rather than 3,600 r.p.m." The advantage of the slower-speed pumps is that they have larger waterways which will not clog so readily as the small openings of the higher-speed pumps. Rubber hose, which is easily handled, especially when making quick moves, usually is used for suction and discharge lines.

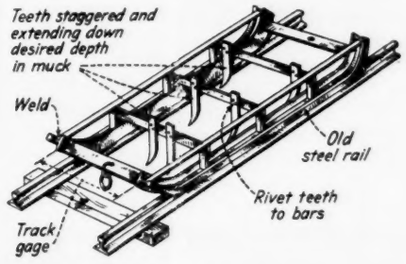
To handle water from heavy rains, 40- or 50-hp. motor-driven pumps are required in most pits. These also are made portable and use rubber hose for suction and discharge lines. For long strip pits, where the terrain is such that all high-wall storm water cannot be ditched away, a stationary pumping station, of perhaps 100 hp., may be required to keep the pit dry. Naturally, such a station must be moved from time to time.

"All pump motors should be the squirrel-cage type, across the line start, ball- or roller-bearing and at least splashproof in construction. Small outfits that frequently are dragged around, should be equipped with totally inclosed motors. Starters, by all means, should be inclosed in weatherproof cases. The low upkeep cost of weatherproofed electrical devices will justify the outlay."

•

Track Cleaning Facilitated By Scarifying Muck

Using a scarifier to loosen the dirt and muck prior to loading has been found very helpful at the Clinchmore (Tenn.) mine of the Clinchmore Coal Mining Co., reports H. A. Evans. Originated by S. G. Moore, general manager, the scarifier, built from scrap steel in the mine shop, is pulled along the track by a locomotive. The hand loaders follow it and place the loosened material in the cars. The scarifier, it is reported, seldom damages a bond.

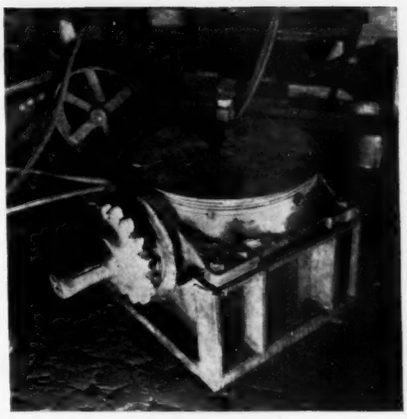


Scarifier construction details. It rides on the regular track rails.

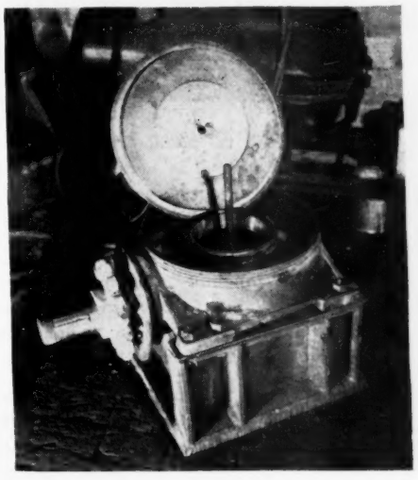
•

Pinion-Case Welding Jig Saves Machining

Use of a special jig has eliminated machining of fitting surfaces of 11BU-loader gathering-head pinion cases after welding in the central shop of the Island Creek Coal Co., Holden, W. Va. The jig assures proper alignment and, by virtue of its heavy construction, resists the strains of expansion and contraction during welding. Included in the jig is a heavy cover plate with machined shoulder to hold the top ring in a true circle.



Welded pinion case cooling in the jig.



Cover removed to show shoulder which fits tightly in the upper circle.

The bottom of the jig consists of a 1-in. steel plate 18x18 in. and onto it are welded two ⅜x2½x9-in. channels which constitute the side pedestals. Each channel is reinforced by four upright ribs and the ends of these channels are tied to each other by cross plates. The top plate, or cover, is 1½ in. thick and is pulled down into place by a ¾-in. bolt anchored to the bottom plate. To facilitate removal of the top plate from the pinion case after a welding job, holes have been drilled in the bottom plate to allow the use of a long bar or punch.

•

Setting Up Drills Facilitated By Mounting Posts on Sleds

Using Goodman shaker conveyors, about 38 in. of Lower Kittanning coal is mined at the Cadogan (Pa.) operation of the Allegheny River Mining Co., writes James Thompson, superintendent. As the seam contains several flaky deposits of hard sulphur and slate, electric drills are necessary for putting in shotholes. Posts furnished with both the Chicago Pneumatic and Jef-

PACED BY THIS IMPROVED JOINT CONSTRUCTION

The NEW CINCINNATI CUTTER CHAIN brings down Coal Cutting Costs in both Duplex and Standard Types

● Designed to handle the toughest possible cutting conditions in normal stride, with a comfortable reserve of strength, the NEW CINCINNATI CUTTER CHAIN brings extra profit opportunities to coal mining.

All the reliability and operating economy for which Cincinnati Chains have been distinguished these many years—PLUS a joint construction completely renewable at low cost.

Joint wear in both block and connector is completely eliminated! The hardened bearing pin in the block, and the hardened insert of the connector get all the joint punishment, but they're made to take it. Naturally they'll wear after a time, but replacement of both parts is fast and inexpensive. With new pins and inserts the PITCH OF THE CHAIN IS EXACTLY THE SAME AS THE DAY IT WAS MADE!

Available in both Duplex and regular types, the NEW Cincinnati Chain far outlasts anything previously offered to the industry. Write for descriptive bulletin giving complete information.

1 **The Connector Insert**
Long lived and readily replaced. New inserts give fresh-from-the-factory accuracy to a worn connector.

2 **The Bearing Pin**
Rigidly locked in the block by the flat on one side.

3 **The Rivet**
Its function is to hold the bearing pin against longitudinal displacement—easy to remove and replace.

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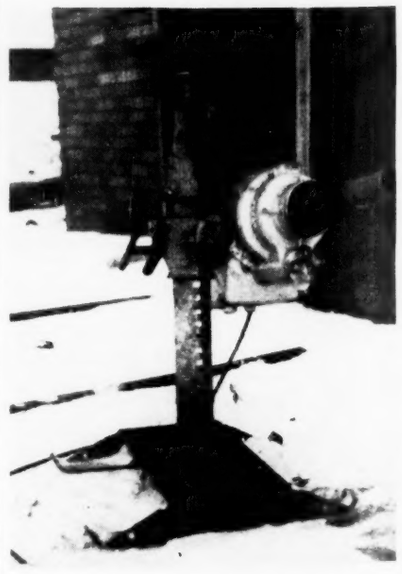
frey drills required two men in setting up or taking down a drill at every hole put in along the 35-ft. faces where conveyors had been installed.

To ease the problem of setting up drills, C. E. Morris, chief electrician, developed the stand shown in the accompanying illustrations. In the construction of this stand, the pointed foot is taken off the post, which then is welded to the sledlike steel base. All drills in the mine have been so equipped. The sled keeps the post always in set-up position, and one man can drag the sled and drill from hole to hole without difficulty, while the remainder of the crew is left free to do other work.

The drill remains on the post from the time a place starts until it is finished. Then it is dismantled with the conveyor and hauled to another working place. The material used in making the sleds is mostly scrap steel, discarded pieces of plate being used for the post base and 1¼-in. angles for the runners. As noted, the sled permits one man to move the drill and do all the drilling. Furthermore, the drill always is up out of water and dirt in operating position. The post is welded to the sled in a leaning position as shown in the illustration. To prevent movement while drilling, a spring is installed in the movable pointed top on the post.



Two views of a drill with sled-mounted post.

ADDITIONAL COPIES AVAILABLE

of "130 Cues to Coal-Mining Profits" which was a supplement to April Coal Age

This chart for study and ready reference wall or desk display shows production for both anthracite and bituminous coal, breakdown of cost per ton of bituminous by regions, amount of mechanically loaded bituminous tonnage and number of units which have been installed, together with the growth of mechanical cleaning in the bituminous industry. "130 Cues to Coal-Mining Profits" also consists of a series of questions to stimulate thought as to the best methods to use in every coal-mining phase from new construction work on through all underground and strip work to preparation-plant practice and refuse disposal.

WHAT'S NEW IN THE FIELD

Constitutionality of Bituminous Coal Act Upheld by Supreme Court

CONSTITUTIONALITY of the Bituminous Coal Act of 1937 (Guffey-Vinson act) was upheld by the Supreme Court of the United States on May 20. The decision, which was delivered by Justice Douglas, affirmed the verdict of the Federal District Court of Eastern Arkansas on Feb. 16 dismissing an attack on the act made by the Sunshine Anthracite Coal Co., Clarksville, Ark. (*Coal Age*, March, 1940, p. 86). The court stood eight to one on the ruling, Justice McReynolds dissenting.

The Sunshine company challenged the validity of the law on the grounds that the 19½ per cent tax imposed on coal produced by operators not signatories to the code is not a tax but a penalty, that Congress lacks the power to fix minimum prices for coal sold in interstate commerce, that there has been an invalid delegation of legislative and judicial power, and that the division of bituminous coal into code and non-code classes is improper.

In the majority opinion, Justice Douglas said: "Clearly this tax is not designed merely for revenue purposes. In purpose and effect it is primarily a sanction to enforce the regulatory provisions of the act. But that does not mean that the statute is invalid and the tax unenforceable. Congress may impose penalties in aid of the exercise of any of its enumerated powers.

"The regulatory provisions are clearly within the power of Congress under the commerce clause of the Constitution. These provisions are applicable only to sales or transactions in, or directly or intimately affecting, interstate commerce. The fixing of prices, the proscription of unfair trade practices, the establishment of marketing rules respecting such sales of bituminous coal constitute regulations within the competence of Congress under the commerce clause.

"Nor does the act violate the Fifth Amendment. Price control is one of the means available to the States and to Congress in their respective domains for the protection and promotion of the welfare of the economy.

"Official and private records give eloquent testimony to the statement of Justice Cardozo in the *Carter* case that free competition had been 'degraded into anarchy' in the bituminous coal industry. Overproduction and savage competitive warfare wasted the industry. Labor and capital alike were the victims. Financial distress among the operators and acute poverty among miners prevailed even during periods of general prosperity. This history of the bituminous coal industry is written in blood as well as in ink.

"It was the judgment of Congress that price fixing and the elimination of unfair competitive practices were appropriate methods for prevention of financial ruin, low wages, poor working conditions, strikes, and disruption of the channels of trade which followed in the wake of the demoralized price structures in this industry."

The commerce clause, it was held, empowers Congress to undertake stabilization of an interstate industry "through a process of price fixing which safeguards the public interest by placing price control in the hands of its administrative representative. There is nothing in the *Carter* case which stands in the way. The majority of the court in that case did not pass on the price-fixing features of the earlier act. The Chief Justice and Justice Cardozo expressed the view that the price-fixing features of the earlier act were constitutional. We rest on their conclusions for sustaining the present act.

"Nor does the act contain an invalid delegation of legislative power. Under Sec. 4, II(c) the Commission [now the Bituminous Coal Division] may fix maximum prices when in the public interest it deems it necessary in order to protect the consumer against unreasonably high prices. These maximum prices must be fixed at a uniform increase above minimum prices so that in the aggregate they will yield a reasonable return above the weighted average total cost of the district. And no maximum price shall be established for any mine which will not yield a fair return on the fair value of the property.

"Nor has Congress delegated its legislative authority to the industry. The members of the code function subordinately to the Commission. It, not the code authorities, determines the prices. And it has authority and surveillance over the activities of these authorities. Since law-making is not intrusted to the industry, this statutory scheme is unquestionably valid.

"Nor is there an invalid delegation of judicial power. To hold that there was would be to turn back the clock on at least half a century of administrative law. The question of whether or not appellant should be subjected to the regulatory provisions of the Bituminous Coal Act was one which the Congress could decide in the exercise of its powers under the commerce clause. In lieu of making that decision itself, it could bring to its aid the services of an administrative agency. And it could delegate to that agency the determination of the question of fact whether a particular coal producer fell within the act.

"The authority of the Commission is clear. There can be no question that it was authorized to make the determination of the status of appellant's coal under the act. It represented the United States in that determination, and the delegation of that power to the Commission was valid."

Keeping Step With Coal Demand

Bituminous Coal Stocks

	(Thousands of Net Tons) April 1 1940	March 1 1940*	April 1 1939
Electric power utilities	9,073	9,128	8,760
Byproduct coke ovens..	5,343	5,875	7,222
Steel and rolling mills.	590	650	1,029
Railroads (Class 1)...	4,660	5,272	7,603
Other industrials†.....	10,419	11,652	10,611
Total	30,076	32,577	35,225

Bituminous Coal Consumption

	(Thousands of Net Tons) March 1940	Feb. 1940*	March 1939
Electric power utilities	4,016	4,217	3,168
Byproduct coke ovens.	5,830	5,676	4,855
Steel and rolling mills.	865	900	805
Railroads (Class 1)...	7,288	7,328	6,970
Other industrials†.....	10,523	10,659	9,988
Total	28,522	28,780	25,786

* Revised. † Includes beehive ovens, coal-gas retorts and cement mills.

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Miners Profit by Mechanization In Bituminous Industry

Labor has been the gainer rather than the loser by the progress of mechanization in the bituminous coal industry, Charles O'Neill, president, United Eastern Coal Sales Corporation, told the Temporary National Economic Committee on April 26 at a hearing held in Washington. "If there were no mechanization within our industry, unemployment would be greater than it is today rather than less," said the witness, "because less coal would be sold and fewer mines would be open. The installation of mechanical devices has made it possible for mines to continue in operation in competition with rival sources of power and heat. Improvements in the processes of production and in combustion practices have actually saved many men employment.

"I have no hesitation," he continued, "in asserting the broad and fundamental proposition that mechanization in the coal industry to date has been a matter of necessity rather than a matter of choice. It has come about not for the purpose of reducing employment, nor for the purpose of increasing the producers' margin of profit. It has been in order to enable the producer to remain in business and to keep his mines open."

Discussing the proposal for a 6-hour day

and 30-hour week, Mr. O'Neill said: "The theoretical effect of such a change would be to pay the miners more money for less work and perhaps in periods of peak production at the mines the temporary employment of some additional men. But the practical result would be reduced output per man per day, increased labor cost per ton and collateral increases in almost all other phases of mining operations. This inevitably would mean increased prices for coal and increased fuel costs to those consumers who continued their present rate of coal consumption. The effect in the long run would be an increased incentive to the invention and adoption of still higher efficiencies in the utilization of coal so as to use less and the more rapid replacement of coal by other sources of energy. It would put an increased premium on mechanization as a means of offsetting the higher labor cost. Taking it all in all, the 6-hour day, 30-hour week in our industry would inevitably result in less demand for coal, less business for the operator and less employment for labor."

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A.C.I. Fuel Conference Brings Big Turnout

A turnout of 344 attended the 25th fuel engineering conference sponsored by Appalachian Coals, Inc., and the fourth annual coal-utilization of the University of Michigan, held jointly April 22 at the latter institution, Ann Arbor, Mich. Those in attendance included representatives of coal-consuming industries, fuel-burning equipment manufacturers, research organizations and retail coal merchants from various sections of the United States and Canada.

Presided over by J. E. Tobey, vice-president in charge of engineering for A.C.I., the conference included the presentation of papers on the progress and trends in utilization of fuel, by Ralph A. Sherman, supervisor, fuels division, Battelle Memorial Institute; the business of mining coal, J. W. Parker, vice-president and chief engineer, Detroit Edison Co.; experiences in coal-burning industrial plants, L. A. Shipman, combustion engineer, Southern Coal & Coke Co.; design of small industrial coal-burning plants, R. C. Porter, instructor in mechanical engineering, University of Michigan; "Systematic Coal Selection," A. W. Thorson, assistant fuel service engineer, Chesapeake & Ohio Railway Co.; designing domestic boilers, furnaces and stoves, F. C. Calhoun, assistant professor of mechanical engineering, University of Michigan; "Servicing Domestic Stoker Complaints," Robert L. Rowan, fuel engineer, General Coal Co. Howard N. Eavenson, president, Clover Splint Coal Co., and a director of A.C.I., as well as R. E. Howe, president, A.C.I., spoke at the banquet.

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To Reopen Murray Mine

Operations are to be resumed on a moderate scale in the near future at what was formerly the Murray colliery of the old Lehigh & Wilkes-Barre Coal Co., according to an announcement on May 4 by E. A. Griffith, vice-president and general manager, Glen Alden Coal Co., Scranton, Pa.

Mineral Wool From Refuse and Ashes, Among Ways to Profits Urges Anthracite Conference

FOR the third consecutive year, the Anthracite Conference of Lehigh University met at the Packard Laboratory, Bethlehem, Pa., May 9-10, to consider ways of increasing the use of anthracite, outstanding among them being the making of mineral-wool insulation. About 500 persons registered. Stressing the value of the exchanges of ideas and fellowship to be derived from the meeting, C. C. Williams, president, Lehigh University, urged that the anthracite industry had its "frontiers" for employment in new uses and unavailed opportunities, and directors of the industry had an opportunity of performing a service to the community.

Liquid fuels, being compounds of carbon and hydrogen, asserted A. A. Norrman, fuel engineer, Delaware & Lackawanna Coal Co., with W. D. Plank, professor, mining engineering, Lafayette College, in the chair, burn rapidly and at a high temperature,

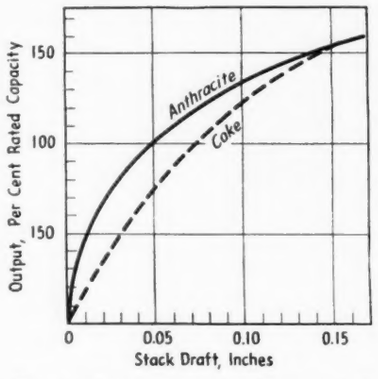


Fig. 1—How increase in chimney draft augments ratio of heat output to rated capacity of furnace to deliver heat.

with noisy combustion. If anthracite is used for domestic furnaces, one firing daily is needed, whereas with coke, four will be necessary if the furnace is filled to the bottom of the firedoor and the damper is left three-fourths open.

Much progress has been made in proper controls for hand-fired furnaces using prepared sizes, but fully automatic equipment is definitely needed. One company at least has produced a complete boiler unit for chestnut anthracite, and 400 such units have been operating for the last four years and have given entirely satisfactory automatic heat, declared Mr. Norrman. Where the interior of the furnace is of 24 in. diameter and 16 in. or more deep, egg coal usually will give best results; where it is of 18 to 23 in. diameter and 12 to 18 in. deep, stove coal is preferable. With a furnace interior of 16 in. diameter, use nut coal.

Anthrafilt, a suitably sized and prepared anthracite, is being used in 65 municipal filtration plants in this country and in four in Canada, also in industrial-water, swimming-pool and oil-removal filters and in filters of other types, at 180 separate points in the United States and at 17 points in foreign countries, including Mexico; three South American countries, England, France, Hawaii and Bahrein, asserted H. G. Turner, filtration consultant, Anthracite Institute.

In Bethlehem, 19.04 gal. of wash water has to be used per thousand gallons of water to be filtered when Anthrafilt is used and 21.13 gal. per thousand when sand is used. Filter-bed expansion on cleaning is five times as great with Anthrafilt as with sand, which means that the spaces between the particles of Anthrafilt are five times as large as the spaces between the particles of sand. Turbidity, color and *Bacillus coli* removal attained with these respective quantities of water are practically identical.

Other case histories were presented by Dr. Turner, and he declared that Anthrafilt filters have greater capacity, give longer runs and permit higher filter rates than sand filters. Anthrafilt filters can be washed cleaner at lower wash-water velocities, will cement less with lime, iron and manganese, and can use coarser sizes than when sand is used. Gravel beds under Anthrafilt stay flat, and the medium contributes no organic or inorganic salts to solutions filtered through it. It is the only medium that can filter hot alkaline solutions with success. No other filter medium is more nearly chemically neutral.

With Anthrafilt, penetration is much deeper than with sand, because particle diameter can be greater. Hence, capacity for precipitant is larger and "back washing" can be delayed longer; even once a week may suffice. When this cleaning is performed, the filter bed should expand 50 per cent, and the lightness of the Anthrafilt makes that easy to achieve.

In discussion, Dr. Turner said he did not regard No. 4 buckwheat as a good filtration medium. Anthrafilt is made in three different sizes, and it is important to get the size that suits conditions. With industrial wastes, one can use a wider range of sizes. No. 4 would not do for municipal work, for drinking water must be freed of bacteria.

More technically educated men are needed in the coal industry, asserted A. C. Callen, dean, College of Engineering, Lehigh University. Statistics show that 325 mining engineers are graduated annually. Continued for 50 years, this would put only one college-trained man in every mine, without allowance for death or displacements; but only sixteen of these men went into coal mining, so, if every coal mine were to be supplied with a technically trained man, 400 years of such activity would be needed.

"Mineral wool," explained H. J. Rose, senior industrial fellow, Mellon Institute of Industrial Research, reading a paper prepared by him and R. C. Johnson, industrial fellow, is a mass of fine interlaced mineral fibers made from various raw materials containing silica, lime, alumina and other ingredients by melting a suitable mixture of them in a furnace, drawing off the material and driving against it while molten a fine stream of steam or air at high pressure, which breaks up the slag into fine globules,

Renewing friendships

Recounting experiences with anthracite in central power stations, C. H. Frick, Pennsylvania Power & Light Co., meets up with W. L. Banta, vice-president, Lehigh Navigation Coal Co.

Guiding session IV

U. S. Bureau of Mines district engineer, S. H. Ash.

Chimneys and Drafts

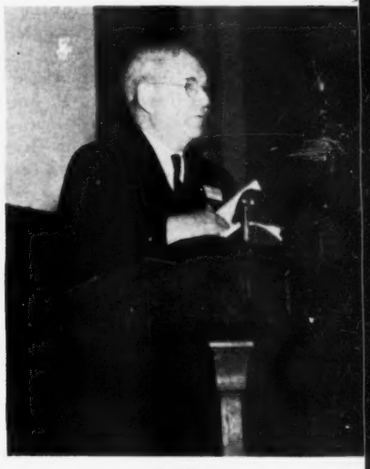
Described by Allen J. Johnson, director of the Anthracite Industries laboratory.

Third annual anthracite conference chairman

Skipper Eckfeldt (center) enjoys hearing about mineral-wool insulation from anthracite ash and culm banks as told by R. C. Johnson (left) and H. J. Rose (right), both from Mellon Institute.

Anthracite in Cupolas

Detailed by J. F. K. Brown, assistant general manager of engineering, Hudson Coal Co.



Analyst

Cadwallader Evans, Jr., vice-president, Hudson Coal Co., points out the trend in use of smaller sizes and explains the economics of anthracite preparation as affected by sizing.

Anthracite and semi-industrial stokers

J. H. Kerrick, combustion engineer, Philadelphia & Reading Coal & Iron Co., gives the practical results.

Opening session II

Chairman A. C. Fieldner of the U. S. Bureau of Mines.

Swapping Ideas

Harry Nold, professor of mining engineering, Ohio State University, and C. C. Wright, associate professor of fuel technology at Penn State.

propelling them like a rifle bullet so that they are drawn into minute fibers.

The product is sold as loose wool, pellets, bats, blankets, blocks, pipe covering and insulating cement. Mail-order catalogs quote the wool in bags at $43 a ton. Freight rates are high, so manufacture is decentralized.

Mineral wool can be manufactured from anthracite ashes and colliery refuse, though, without fluxes, they would not melt at a sufficiently low temperature. Quantity of lime need not be regulated with exactitude, as Fig. 2 shows. Ashes and refuse contain enough or almost enough combustible matter to melt them. Domestic and industrial anthracite ashes have 25 to 30 per cent combustible (only about 5 per cent of the heat, however, of the original coal). Colliery refuse has 20 to 50 per cent of combustible, depending on size, method of preparation, etc.

Household ashes contain much fine material and could not be burned at high rates in deep fuel beds because of high air pressure required and quantity of fines blown out of bed. Hence agglomeration, briquetting or removal of fines must precede wool making. Other uses might be found for the fines. Assuming anthracite colliery refuse to cost $1 per ton at wool plant, cost of manufacturing the product would appear to be 20 per cent lower than that of producing slagwool and 50 per cent less than that of making rock wool.

Bread baking, according to O. E. McGregor, treasurer, Williams Bakery, speaking at the second session, with A. C. Fieldner, chief, Technological Branch, U. S. Bureau of Mines, in the chair, is an industry that might furnish a steady market for anthracite. His company had a steam-tube traveling oven 15 years old. The plant has been shut down twice and the fireboxes have been repaired, but the cost is still 6c per 100 lb. of baked bread. With buckwheat anthracite, the cost would be 2.4c instead of 6c. The heat is carried to the oven in steel tubes. Baking with rice anthracite instead of with manufactured gas cut cost to one-fourth, declared one commentator.

Stoker-feed worms corrode at the end near the hopper, observed H. F. Miller, sales manager, MotorStokor Division, Hershey Machine & Foundry Co. At first, deterioration was ascribed to abrasion, but it was found that residence stokers burning 8 tons a year lasted half to a sixth as long as larger stokers burning 50 to 60 tons yearly.

Air streams entering the burner tuyeres near the base of the retort meet and turn downward, carrying gases of combustion with them, especially where defective chimneys or dirty flues put pressure on the fire. Small stokers have shallow retorts, so the gas zone is close to the worm tip. Use of non-corrosive material or passage of a fresh-air stream over the worm increases its life. Inspection after five years indicates that the tips will now last eight or more years.

In 65 installations, 2½ to 3 years old, average maintenance cost, said Mr. Miller, is $3.06 per year. One dealer's experience showed that in 27 per cent of the service calls, the stoker was at fault, in 24 per cent the fuel was faulty, in 12 per cent the fire needed adjustment for a change in fuel, in 25 per cent the consumer had failed to remove ash, and in 12 per cent he had not supplied coal. A third of the gasoline sold for automobiles commands a premium price. Why should there not be a premium anthracite for stoker purposes? Mr. Miller believes there would be a sale for it.

With all normal domestic chimneys, rate of combustion of chestnut anthracite as fired in a cast-iron sectional boiler with 3 sq.ft. of grate area and a 14-in. depth of fuel bed varies almost in proportion to chimney height, asserted A. J. Johnson, director, Anthracite Industries Laboratory. With stack properly constructed and boiler correctly connected, chimneys of less than usual cross-sectional area will give adequate draft, and perhaps eddy currents and excessive cooling in oversized or flat rectangular flues may even reduce net efficiency of the stack.

With 3 sq.ft. of grate area, an increase in stack height from 20 to 30 ft. produced a greater boiler output than a doubling of the grate area to 6 sq.ft. Thus, 3 sq.ft. of grate surface seems to be the upper capacity of the 9x9-in. tile linings used, which internally measure 7¼x7¼ in. Pea coal burns only 70 per cent as fast as chestnut and stove coal 10 per cent faster.

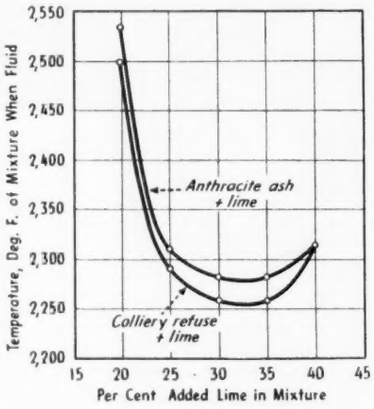


Fig. 2—How added lime lowers fluid temperature of mix for wool making.

Air-bound cellars probably are the single factors most responsible for slow combustion, but enough air to cool cellar and floors must not be admitted. In 50 houses taken at random, 25 per cent suffered definitely from a lack of effective air supply, extending from one to four hours the time required to raise the temperature from 65 to 70 deg. Perhaps fresh air should be piped direct to ashpit for combustion. Quantities of heated air can be wasted through the flues of unused fireplaces.

In discussion, Mr. Miller declared that calcium chloride will corrode feed worms, but another stated that if untreated coal is run through the stoker at the end of the season, calcium chloride will be removed and will be absent in the summer when corrosion is most effective. If anthracite is treated with oil it should be done just before delivery or the coal will look dirty, asserted Dr. Johnson.

Calculation shows, declared Cadwallader Evans, Jr., vice-president, Hudson Coal Co., for himself, and H. G. Boyd, engineering statistician, with W. H. Lesser, mining and electrical engineer, in the chair, that anthracite operators would lose daily $324,552, by breaking the still-marketed chestnut and larger sizes of anthracite to pea and smaller sizes. This calculation is based on the daily tonnage figures of the present allocation scheme—240,000 net tons, of which 127,584 net tons is in chestnut and larger sizes.

Fuel oil reached its lowest price in 1931, bituminous coal in 1932, coke in 1933 and anthracite in 1937. Perhaps the rise in anthracite prices in 1938 is significant of a definite upward trend, asserted J. D. Jillson, sales engineer, Anthracite Industries, Inc. In the United States anthracite-consuming area are about 4,000,000 homes with central heating and 68 per cent are using coal, despite 20 years of intensive sales work to wean them away to oil and gas. Most of those which have equipment to burn coal are potential purchasers of anthracite, as either kind of fuel can be used in their stokers.

As 69 per cent of all families in this country have incomes less than $1,500 annually and as an installed conversion oil burner costs $268, or 18 per cent of a $1,500 income, a switch to oil seems unlikely. Oil burners are not bought like cars, for 48.5 per cent of them are sold for cash. With $133 for fuel oil, 10 per cent of $268 for depreciation and also interest on original investment, and repair or service, the cost to heat a 10-ton home with an oil burner will be about $185. With anthracite at $12 a ton, the same house with hand firing would be heated for $120. With consumer magazines and government bulletins telling the facts, it does not seem likely this low-income group will go to oil burners—much less to gas burners.

Again, added Mr. Jillson, the Real Property Inventory shows that 57 per cent of occupants rent the dwellings in which they live and such people will not invest in equipment that might not fit another house or would be costly to move. As 50 per cent of all rental dwelling units have monthly rentals below $25, the owner cannot afford to provide an oil furnace. Moreover, residential housing is definitely on an upswing.

"Radiant heating" is designed to heat the body by radiance rather than by heating the air, said B. H. Jennings, associate professor, mechanical engineering, Lehigh University, at the fourth session in the morning of May 10, over which L. E. Seeley, assistant professor, Yale University, presided. The aim is to keep air cool and body warm. Sources of radiant heat may be in the ceiling, walls or floor. One often experiences pleasure from a cool breeze while warmed by the sun's radiance. This desideratum, radiant heating simulates. Convection air temperatures from, say, 60 deg. F. to 70 deg. F., with temperatures of walls and surroundings controlled to regulate radiant heat loss from the body, are feasible and give perfect comfort.

Temperature usually is more uniform from floor to ceiling than with convection heating. With wall or ceiling panels, floor temperature may be even higher than that 5 ft. above floor. Pipes to heat by radiance in winter can be used for radiant cooling in summer, but their temperature in general must be kept above dew-point temperature of the air. However, with radiant

The LESCHEN Proving Ground

A section of the Leschen Laboratory where wire is being tested to determine its fitness. In this department are many other instruments, among which is an 800,000 pound capacity machine for determining the actual breaking strength of completed wire ropes.

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"HERCULES" (Red-Strand) Wire Rope owes much of its outstanding performance record to the many rigid tests that must be undergone and survived, even before its actual manufacture begins.

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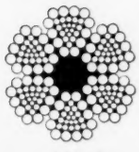
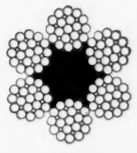
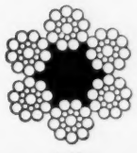
The illustrations at the right show a few of the many constructions in which "HERCULES" is available. All can be furnished either Standard or Preformed. We would welcome the opportunity to recommend the construction and type we consider most suitable for your conditions.



Style G
Flattened Strand



6x19
Filler Wire



6x19
Seale

6x37
Type

A. LESCHEN & SONS ROPE CO.

WIRE ROPE MAKERS — ESTABLISHED 1857

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NEW YORK . . . 90 West Street
CHICAGO . . . 810 W. Washington Blvd.
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SAN FRANCISCO . . . 520 Fourth Street
PORTLAND . . . 914 N. W. 14th Avenue
SEATTLE . . . 3410 First Avenue South

heating, original equipment cost is raised 20 to 30 per cent and is not practical except with new construction or complete renovation.

Heat losses when coils are located in walls exposed to the outside temperatures may be greater than with convection heating, and temperature changes may be slow if the wall absorbs too much heat, but the latter can be reduced by embedding the pipe only in lath and plaster. Leakage or corrosion of tubing may be more serious than with convection heating.

Describing plans and progress of anthracite research at Pennsylvania State College, A. W. Gauger, director, mineral industries research, for himself and C. C. Wright, associate professor of fuel technology, both of Pennsylvania State College, stated that the studies being undertaken under the terms of Act No. 392 of the Pennsylvania General Assembly covered stability of anthracite under the stresses, dynamic and thermal, in generation of water gas.

In pursuance of this study, a weighed sample of coal in a steel-mesh basket is charged into a pot furnace previously heated to an equilibrium temperature of 1,600 deg. F. This charge is blasted for one hour with hot reducing gases, dropping to a temperature of about 1,400 deg. F. The charge is then removed and dry-quenched. When cold, it is carefully removed and screened to determine the decrepitation due solely to temperature changes. This coal is then drop-shattered according to the standard American Society for Testing Materials test and resultant material again screened. The results suggest that in certain cases, egg coal may resist gas flow in the generator less than "broken" coal from the same colliery.

Anthracite producer gas, asserted Eric Sinkinson, associate professor of fuel technology, Lehigh University, giving descriptions of twelve installations, is efficient and its low content of hydrocarbon makes it clean in use and an essential gas for delicate annealing operations in non-reactive atmospheres.

With regenerators and recuperators, it will furnish the heat needed for high-temperature furnaces satisfactorily, because of its cheapness per thermal unit. Moreover, it has an advantage over more expensive gases where rich or lean furnace atmospheres, controllable at will, are required.

No. 4 buckwheat has no industry-wide standard, stated C. H. Frick, plant-betterment engineer, Pennsylvania Power & Light Co., but many coal companies use his company's standard: 5 per cent over 1/16 in.; 75 per cent, 1/16 x 1/32 in.; 10 per cent, minus 1/32 in., all round-hole screens. Moreover, negotiations have been made with various coal companies for the preparation of No. 5 buckwheat, which would have the following specifications: 5 per cent plus 1/16 in.; 35 per cent, 1/16 x 1/32 in.; and 60 per cent, minus 1/32 in., all round-hole screens.

Ash-handling equipment was described by E. L. Willson, sales-promotion manager, Lehigh Navigation Coal Co., Inc., at the afternoon session, over which J. F. Barkley, U. S. Bureau of Mines, presided. After last year's conference, J. F. K. Brown, assistant general manager of engineering, Hudson Coal Co., decided to test anthracite in a cupola, using anthracite instead of coke at a delivered cost of $8.63 per ton.

In the anthracite market area he found the annual melting capacity of cupolas was 10,024,900 tons, the number of foundries 1,988, and the fuel market attainable by securing all cupola trade roughly 500,000 tons. To egg anthracite was added 7.5 lb. of limestone per 100 lb. of coal. Iron thus produced is clean and its quality satisfactory.

To semi-industrial consumers of coal a selection of equipment is available that will give them, as they desire, automatic or semi-automatic control of steam generation, efficient in operation with low-cost maintenance and minimum boiler outage, asserted J. H. Kerrick, fuel engineer, Philadelphia & Reading Coal & Iron Co., in the closing session, at which S. H. Ash, district engineer, U. S. Bureau of Mines, presided.

There are 25 or more brands of stokers and 184 models and sizes, declared I. J. Fairchild, chief, division of trade standards, National Bureau of Standards. Hence, the need for standards for anthracite-burning equipment is compelling.

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Black Powder Shot Blamed for Explosion At Willow Grove in Bureau Report

A SHOT of black blasting powder caused the explosion March 16 in the Willow Grove mine of the Hanna Coal Co. of Ohio, Neffs, Ohio, in which 72 lives were lost, according to a final report made public April 26 by Secretary of the Interior Harold L. Ickes. The report states, in part: "After carefully considering observations made during recovery operations, evidence and information obtained throughout the investigation, the results of analyses of dust and air samples collected in the mine, and careful weighing of the testimony presented during the hearings conducted by the Department of Industrial Relations of Ohio, the Bureau investigators are of the opinion that this explosion originated in the face of 8 West Entry off 22 South; that the explosion was caused by the firing of a shot of black pellet powder stemmed with bug dust which ignited a cloud of coal dust, in which gas may or may not have been present; and that the explosion was propagated throughout the affected area by coal dust which was raised in suspension by the initial explosion."

The report, which was prepared by J. J. Forbes, supervising engineer of the safety division; G. W. Grove, senior mining engineer; and J. W. Fene and M. J. Ankeny, mining engineers, asserted that the past safety record of the mine was good and that the company had gone to considerable effort to train its men in safety practices. "It is evident," it continued, "that the attitude of the management toward the general problems of safety has been exceedingly favorable, and probably as much has been done to safeguard the employees against ordinary mine accidents at this mine as at any other mine in Ohio."

Although the mine is classified as nongassy, Bureau investigators found evidence that some methane was given off in the workings. Analysis of air samples disclosed that "a considerable amount of explosive gas is being liberated in the mine." In view of this, the engineers expressed the opinion that "this mine should be classed as gassy and be operated accordingly."

The report criticised the ventilation system, based on using the main haulage as the return. "The installation of haulage roads on 'intake' air is a strongly recommended safety practice, especially where hauling is done by trolley locomotives," the report said. "The fact that the haulage in the Willow Grove mine was on return air was responsible for the death of three men and endangered the lives of 104 others." The report made various recommendations for improving the mine's ventilation system and pointed out that the system had to be changed before removal work could be pushed following the explosion.

The mine was dry and dusty, according to the report, with no provision for wetting down the coal as it was removed, or for keeping the coal dust caused by the mining machines and equipment wetted down. The force of the explosion caused numerous roof falls and thousands of tons of rock had to be removed during recovery work. Several factors prevented the explosion from spreading further, among them being the extensive falls which helped "choke" the explosion; the opportunity for expansion when the explosion wave reached main headings, and the moderately high incombustible content of road and rib dust in the headings and haulageway.

Discovery of an exploded powder storage box in the affected area led State and company investigators to believe that the explosion originated at the box. The Bureau men, however, after weighing all evidence, expressed the opinion that the original explosion started with the firing of the shot of blasting powder and that the powder magazine blew up subsequently. Evidence accumulated by extensive research by the Bureau on explosives and explosions supports its belief that the blasting shot started the Willow Grove disaster, the report said. In discounting the theory that the explosion originated at the powder box, the Bureau report said that no satisfactory reason could be produced for the ignition of the magazine other than its firing during the general explosion started by the blasting shot.

All evidence, said the report, indicates that a blasting shot was fired "immediately prior to the explosion." Analysis of scrapings from the shothole showed definitely that black powder was used and that an excessive quantity had been placed in the hole. "This violent blasting and movement of the coal, in addition to the bug-dust stemming in the hole, doubtless threw considerable coal dust into the air, and this dust, together with dust raised by the preceding rock shot, probably formed

(Turn to page 100)

COMPLETE INFORMATION

On Equipment, Materials and Supplies

At Cincinnati Show, April 29 to May 3, 1940

WOULD you like to have more information on the important array of equipment shown at the recent National Exposition of Coal Mining Equipment of the American Mining Congress at Cincinnati? An editorial summary of the high spots of the show appear on pp. 63 to 78 of this issue. For those who desire additional data *Coal Age* also makes this special arrangement to enable you to get further specific information without cost or obligation. Simply mail the accompanying postcard, with your name and address, to *Coal Age*—no postage necessary—and your request will receive our prompt and careful attention.

Products exhibited are listed below, classified alphabetically by companies sponsoring them. Each company has a number. Corresponding numbers appear on the postcard. To obtain any manufacturer's data, simply circle the "company numbers" of interest to you and drop the postcard in the mail. *Coal Age*, upon receipt, will see that you are furnished promptly with desired details.

1 ABBE ENGINEERING CO.: Abbe-Greening wedge-wire slotted screens in various metals.

2 ADVERTISING DISPLAYS, INC.: Animated safety messages.

3 AIR REDUCTION SALES CO.: Airco oxygen and acetylene welding and cutting apparatus and supplies; "National" carbide and carbide lights (National Carbide Co.); portable "Hornet" and "Wasp" arc-welders, welding electrodes and accessories (Wilson Welder & Metals Co.); "Pureco" carbon dioxide (Pure Carbonic, Inc.)

4 ALLIS-CHALMERS MFG. CO.: Low-head Sta-Kleen vibrating screens. Vari-Pitch and Vari-Motion speed changers; SSU centrifugal pumps, HD14 diesel tractors; motors; Texrope drives.

5 LOUIS ALLIS CO.: Electric motors for coal mines, including a.c. and d.c. protected types for surface and underground use; Bureau of Mines type d.c. explosion-proof motors; Adjusto-Spede variable-speed a.c. motors.

• COAL AGE launched this service in 1937; repeated it in 1938 and 1939. Last year, these listings developed 2,675 requests for manufacturers' literature from hundreds of officials and engineers at various mining companies, located in every coal-producing region of the country. We hope you use and profit from this service again this year. It's yours for the asking!

6 AMERICAN BRATTICE CLOTH CORPORATION: Mine-Vent ventilating tubing; new demountable split coupling; various types of tubing suspensions.

7 AMERICAN CAR & FOUNDRY CO.: New large-capacity mine car with double knee-action swivel trucks and automatic couplers.

8 AMERICAN CHAIN & CABLE CO., INC.: American Cable Tru-Lay and Hazard Lay-Set wire ropes.

9 AMERICAN CYANAMID & CHEMICAL CORPORATION: Dynamites, permissible explosives and blasting powders; blasting accessories.

10 AMERICAN STEEL & WIRE CO.: (See U. S. STEEL CORPORATION, No. 126).

11 ANACONDA WIRE & CABLE CO.: Improved Sunex Securityflex mining-machine cable; other cords, cables and conductors for mining services; Anaconda borehole suspension.

12 ATLAS POWDER CO.: Sheathed permissible explosives.

13 BARBER-GREENE CO.: Chain-type room conveyors; low-headroom belts; truck-loading conveyors; portable conveyors and stackers; barge-loading equipment.

14 BEMIS BRO. BAG CO.: Flexipipe-ventilating tubing; couplings; rope-seam suspension and sliding suspension clamp.

15 BETHLEHEM STEEL CO.: Steel-tie turnout with 40-lb. rails, including welded-on heel blocks, ties of welded construction, switch stand and reflector target; manganese frogs; range of steel ties; Mayari-R mine car; steel mine-car wheels on heat-treated through axles; wire rope, stressing preforming and "Bethanizing"; Superior hollow drill steel.

16 BIXBY-ZIMMER ENGINEERING CO.: Stainless steel and bronze screens for sizing, dewatering, etc.

17 BOWDIL CO.: Bowdil "Orbit" valves; Bowdil cutter bars, chain and bits, and Bowdil wire-rope clips; Bryant "Choke Arc" transfer switches.

18 BRODERICK & BASCOM ROPE CO.: Yellow Strand wire rope, both standard construction and "Flex-Set" preformed; Yellow Strand plaited safety slings.

19 BROWN-FAYRO CO.: HKL conveyor car-spotting hoist; HGD conveyor auxiliary hoist; BC tubing blower; RD electric car retarder; 2F8 high-pressure oil-spray pump; SH magnetic switch; re-railers for 20- to 60-lb. rails.

20 L. M. BROWN, INC.: Semi-automatic bit-forging machine and furnace with new conveyor and cooling system; alloy steel (manganese-silicon-molybdenum-vanadium) cutter bits.

21 CALCIUM CHLORIDE ASSOCIATION: Dry-flake application of calcium chloride for freeze-proofing and dust-proofing.

22 CARDOX CORPORATION: 4-ton low-pressure liquid CO_2 storage tank and low-pressure charging plant; complete range of Cardox shells.

23 CARNEGIE-ILLINOIS STEEL CORPORATION: (See U. S. STEEL CORPORATION, No. 126).

24 CENTRAL ELECTRIC REPAIR CO.: Tramp-iron and steel-removal magnet; field-coil tester.

25 CENTRIFUGAL & MECHANICAL INDUSTRIES, INC.: Elmore continuous centrifugal dryer.

26 CHICAGO PNEUMATIC TOOL CO.: Post-mounted electric coal drills and mounted hand-held portable coal drills, in open and permissible types, featuring No. 571 Whippet-type electric drill; model of self-propelled rubber tired, truck-mounted coal drill equipped with two coal drills

operated by two men, permitting drilling of two holes simultaneously. Also, portable electric and pneumatic drills, nutrunners, grinders, chipping hammers, riveting hammers, etc., for repair and maintenance.

27 CINCINNATI MINE MACHINERY CO.: New Cincinnati cutter chain with renewable joint; Cincinnati Duplex chains and bits; also Cincinnati improved cutter bars for regular and thin-kerf cutting.

28 CITIES SERVICE OIL CO.: Mine lubricants.

29 COAL MINE EQUIPMENT SALES CO.: Used and rebuilt mine equipment.

30 COFFING HOIST CO.: Safety-pull ratchet lever hoists and load binders, built in capacities from ¾ to 15 tons; new Power Master gravity lowering chain hoist, 1 to 8 tons; Model C spur gear chain hoist, differential hoists and trolleys; "Quik-Lift" electric hoist.

31 COLUMBIA STEEL CO.: (See U. S. STEEL CORPORATION, No. 126).

32 DEISTER CONCENTRATOR CO.: Deister-Overstrom Diagonal-Deck coal-washing tables, Leahy No-Blind heavy-duty vibrating screens and Concenco spray nozzles, including new Super Duty No. 7 coal-washing table powered by the new Concenco anti-friction bearing, self-oiling, with fully inclosed head motion.

33 DEISTER MACHINE CO.: Deister Plat-O vibrating screens; Plat-O coal-washing tables, including late-type large-capacity units.

34 DEMING CO.: 5x5 piston gathering pump; deepwell turbine pumps; small centrifugal sump pumps for rooms, water cars, etc.; pump parts.

35 DIFFERENTIAL STEEL CAR CO.: Differential "Axless" locomotives and mine cars; differential lorry cars.

36 THOMAS A. DILLON: Dillon full-floating, circle throw vibrating screens.

37 DUFF-NORTON MFG. CO.: 24 jacks applicable to coal-mine use, including: adjustable mine timber jack; line of 5-ton automatic lowering jacks; a mine roof jack; and other types of Duff-Norton jacks, such as ball-bearing screw jack, 4-way chain jack, journal jacks, trip or track jacks, and pinion puller.

38 E. I. DU PONT DE NEMOURS & CO.: Permissible explosives; chromated zinc chloride wood preservative; and the new hydraulic mining process.

39 THOS. A. EDISON, INC.: Nickel-iron-alkali storage batteries.

40 ELECTRIC CONTROLLER & MFG. CO.: 1,500-amp. Form XLP sectionalizer; 300-amp. Form X sectionalizer; 2300-volt oil-immersed across-the-line motor starter.

41 ELECTRIC RY. EQUIPMENT CO.: Overhead line materials; feeder and control switches; new junction box for mechanical mining.

42 ELECTRIC RY. IMPROVEMENT CO.: Rail bonds; bonding apparatus, welding equipment and welding rods for bonding purposes.

43 ELECTRIC STORAGE BATTERY CO.: Types MVM, TLM, MEH and FLM Exide-Ironclad batteries; complete Exide-Ironclad battery for Joy shuttle cars.

44 ENTERPRISE WHEEL & CAR CORPORATION: Four-axle-type mine car, 108 cu.ft. capacity; Smith pit-car loader.

45 JOHN FLOCKER & CO.: Moropa cotton brattice cloth.

46 FLOOD CITY BRASS & ELECTRIC CO.: Car spotting hoist; line of section insulators, foot valves, line material, permissible d.c. starters, pump impellers, cable vulcanizers, bonds, transfer switches, etc.

47 GENERAL ELECTRIC CO.: Bureau of Mines approved d.c. motors and controls for underground mining service, including G-E type CY-302, Class BM loading-machine motor; standard d.c. controls, a.c. gearmotors, dust-tight a.c. starters; pushbutton stations; borehole cable, Versatol for tipple wiring, and tellurium power cable for shovels and mining machines; a resistor arc welder with accessories; mercury-arc rectifier; 15-ton low-vein haulage locomotives (26 in. high) with air brakes; single-handle reversing drum controller with cam-operated contactors; locomotive transfer switches; etc.

48 GIBRALTAR EQUIPMENT & MFG. CO.: New multiple leverage rail punch; Gemco Tru-Blue "Slip-On" combination tools, formed by changing fittings on one handle; adapter to fit portable punch for shop use; rail benders, including new B-12; tool-truck parts; car stops; rerailers, etc.

49 GOODMAN MFG. CO.: New Type 460 track loading machine designed for loading coal around the corner of a room neck turned at right angles to the entry; new hydraulic control system now available for Goodman track loaders; Type 97-30 troughed belt conveyor, de luxe 512 shortwall; Type 212 low-vein (19 in. high) shortwall; shaker conveyor consisting of a G-20 drive operating a line of pans and an A3H duckbill, together with trough supports and other conveyor items.

50 GORMAN-RUPP CO.: Self-priming centrifugal mine gathering pumps.

51 GOULD STORAGE BATTERY CORPORATION: Gould Kathanode "Glass-Klad" batteries; Gould shutter-car batteries.

52 GULF OIL CORPORATION: Mining lubricants.

53 GUYAN MACHINERY CO.: Portable resistance arc welder; locomotive, mining machine and slip-ring motor resistances; a choke resistance; a lightweight mine inspection car.

54 HENDRICK MFG. CO.: Perforated screen plates, dewatering screen plates, grilles and grating; stainless steel dewatering screens: lip screens for sizing and dewatering.

55 HERCULES POWDER CO.: Permissible explosives.

56 ILLINOIS STATE GEOLOGICAL SURVEY: Illinois preparation plants; research; smokeless briquets.

57 I-T-E CIRCUIT BREAKER CO.: New 1,000-amp. 250-volt Type KSC automatic reclosing sectionalizing circuit breaker; 1,200-amp. 250-volt Type KSA automatic reclosing switchboard circuit breaker; 600-amp. 250-volt Type ETB manually operated circuit breaker; Type LDR load distributor.

58 JEFFREY MFG. CO.: Type 29-U universal coal cutter; Type L-400 high-capacity loading machine; Type 61-CL tire-mounted conveyor loader; Type 8H Aerodyne mine fan; Aerodyne midget blowers; Types A-7 hand-held and A-6 post drills; Flextooth crusher; electric vibrating Conveyanscreen; diaphragm jig as part of a unit washery for small tonnages; electric vibrating pan feeder; and miscellaneous items such as belt idlers, chains, etc.

59 JOHNSON - MARCH CORPORATION: Dustless treatment of coal with Coalaid or Coaladd.

60 JOY MFG. CO.: 11 BU high-vein loader; 14 BU high-capacity low-vein loader; 42-in. shuttle car; 32-in. shuttle car for low coal; new Joy safety drill; Joy caterpillar mining machine trucks.

61 KANAWHA MFG. CO.: Belknap chloride coal washers.

62 KING POWDER CO.: New "Red Crown" surface sensitized permissible explosives.

63 KOPPERS CO.: Creosote treatment of mine ties and timber; Koppers AR-moored mine ties (Wood Preserving Corporation); preparation equipment and services, including the Koppers-Menzies cone separator (Koppers-Rheolaveur Co.).

64 LA-DEL CONVEYOR & MFG. CO.: SRU-16 reversible shaker conveyor; La-Del Troller 2-stage controllable pitch fan and room blowers; RB-18 room belt conveyor.

65 LEE-NORSE CO.: Four-wheel-drive four-wheel-steer rubber-tired shuttle cars holding 2½ tons to 10 tons in both storage-battery and cable-reel types.

66 A. LESCHEN & SONS ROPE CO.: Samples of wire ropes used on all types of coal-mining machines and equipment, including Hercules Red Strand wire ropes in both standard and preformed types.

67 LINK-BELT CO.: Conveyors from the mine, coal tipple and cleaning equipment, air-pulsated wash box, crawler shovels and draglines for strip mines, coal- and ash-handling equipment; automatic stokers; Link-Belt Roto-Louvre dryer, new two-roll coal sizer with motor-operated roll adjustment; "P.I.V." gear variable-speed transmission.

68 MCLAUGHLIN MFG. CO.: McLaughlin cutting heads and bits for coal drills; conveyor and twisted coal augers.

69 McNALLY-PITTSBURG MFG. CORPORATION: Washing, drying, screening, crushing and other preparation equipment and services.

70 MACWHYTE CO.: Swaged cable terminals; specially designed wire ropes for all types of mining equipment.

71 MANCHA STORAGE BATTERY LOCOMOTIVE CO.: Storage battery locomotives.

72 MARION STEAM SHOVEL CO.: Photographic display of shovels for coal stripping and loading, including new "knee-action" stripping shovels.

73 MARKHAM PRODUCTS CO.: Markham adjustable mine prop for roof support with special cap plates for various sizes and shapes.

74 METAL & THERMIT CORPORATION: Thermit rail-welding equipment; Murex welding electrodes.

75 MINES EQUIPMENT CO.: Miller cable connectors; Miller rubber-cable vulcanizer; new spot heater for high-temperature soldering of cable joints.

76 MINE SAFETY APPLIANCES CO.: Edison Model "P" electric cap lamp and M.S.A. Comfo caps; newly designed methane gas instruments including a continuous recorder to supplement the M.S.A. methane detector; back-type one-hour oxygen breathing apparatus; single-filter Dustfoe and Comfo dust respirators; gas masks with new all-vision facepieces; a special hand flood lamp; Foille spray kit for treating burns; "Velocity Power" rail punch and "Velocity Power" cable splicer for trailing cables, etc.; explosively actuated portable tools using blank cartridges as source of energy; Rheoderm apparatus for treating athlete's foot; complete line of standard equipment, including self-rescuers, portable and semi-portable rock-dust distributors, trolley-wire guards, Bakelite explosives carrier, midget impinger for sampling dusts, first-aid materials, eye protection, safety clothing, and the H-H inhalator.

77 MINING MACHINE PARTS, INC.: Hydraulic pressure pump for mining machinery; improved loading-machine parts; "Dymonhard" hard-facing rods and welding electrodes.

78 MORROW MFG. CO.: Morrow standard washing unit, 100 tons-per-hour capacity.

79 MYERS-WHALEY COMPANY: No. 3 L. S. Whaley Automat coal-loading machine.

80 NAIL CITY BRONZE CO.: "Hi-Led-Loy" non-freezing bearings; high-strength titanium-bronze.

81 NATIONAL ELECTRIC COIL CO.: Coil service.

82 NATIONAL MALLEABLE & STEEL CASTINGS CO.: Naco cast-steel mine-car wheels, mine-car hitchings; friction draft gears; Willison automatic couplers; combination coupler and draft gear.

83 NATIONAL TUBE CO:. (See U. S. STEEL CORPORATION, No. 126).

84 NORDBERG MFG. CO.: A 3x10-ft. double-deck Symons screen with drive at feed end.

85 OHIO BRASS CO.: Control and connection equipment for mine service; new rubber cable junction plug, new ADG explosion-proof motor starter, Type B interlocking multiple junction box; and O-B wedge bond; track drill for wedge bonding; overhead line materials; bonds and bonding equipment; starters; sectionalizing switches; etc.

86 OHIO CARBON CO.: Complete line carbon brushes; burnishing tools for polishing commutators; collector ring brush for G.E. reel.

87 OSMOSE WOOD PRESERVING CO. OF AMERICA, INC.: Osmose process of wood preservation.

88 OWENS-CORNING FIBERGLAS CORPORATION: Fiberglas electrical insulation for the mining industry—Fiberglas tape, braided sleeving, tying cord, covered wire, etc.

89 PENN MACHINE CO.: Super-Weld rail bonds, including the Everlast, the TP-9 removable, the minimum length PM-10 joint bond, and U bonds; special alloy non-scoring bronze axle liners, journal liners, bushings and bearings; new form "Stronger Tooth" hardened solid gears and armature pinions for mine locomotives.

90 PENNSYLVANIA ELECTRIC COIL CORPORATION: Coils for mining equipment, including vacuum Bakelized field coils for coal cutters and mining locomotives.

91 PHILCO CORPORATION (Storage Battery Division): Permissible shuttle-car batteries in steel tanks; storage-battery cells, including Monobloc units.

92 PORTABLE LAMP & EQUIPMENT CO.: New portable electric cap lamp and "track tackle" haulage safety devices (car stops, trip stops, derailers, crossover switches, etc.); goggles, respirators, safety shoes, "Cool Caps" and hats, safety belts, permissible blasting units, powder bags, heated first-aid cabinets, etc.

93 POST-GLOVER ELECTRIC CO.: Resistance grids for mine locomotives and mining machines; resistance-type welder; locomotive transfer switches; motor starters; split washers and thrust collars.

94 PRODUCTIVE EQUIPMENT CORPORATION: "Selectro" vibrating screens, including special dewatering types; other vibrating screens.

95 FRANK PROX CO., INC.: Invincible chains for regular mine bits and the new Invincible ToolSteeL chains for factory-made, double-pointed bits of alloy tool steel.

96 PURE OIL CO.: Mining lubricants, including special types designed to withstand extreme conditions of heat and cold.

97 ROBERTS & SCHAEFER CO.: 6-ft.-wide Stump Air-Flow coal cleaner; Raymond heat dryer for fine coal; other coal-preparation equipment.

98 ROBINS CONVEYING BELT CO.: New Eliptex vibrating screen; belt-conveyor idlers; other preparation and coal-handling products.

99 JOHN A. ROEBLING'S SONS CO.: Complete line of wire products including wire rope and fittings, wire cloth and electrical wires and cables.

100 ROME CABLE CORPORATION: Samples of portable wire and cable, featuring Rome "60" for locomotive and mining-machine cable.

101 SAFETY FIRST SUPPLY CO.: Resuscitator-inhalator; head and eye protectors and respiratory devices; asbestos clothing; aluminum ladders; shot-firing reels; other safety equipment.

102 SANFORD-DAY IRON WORKS: Automatic dumping bottom 78-cu.ft. car 22 in. high above rail; new S-D "shuttle car"; S-D "Floater" wheels; ball-bearing tool-car trucks; photographs and literature on Sanford-Day automatic bottom discharge trailers.

103 SHELL OIL CO., INC.: Mine lubricants and dustproofing oils including new "Shell Dedusting Compound."

Circle on the back of this card the numbers of the companies on which additional information is desired. No obligation. The card requires no postage.

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104 SIMPLEX WIRE & CABLE CO.: New markings on all stock sizes of "Tirex" cords and cables; ANHYDREX non-metallic cables for power distribution and telephone service; special cables.

105 SIMPLICITY ENGINEERING CO.: Gyrating coal screens.

106 SOCONY-VACUUM OIL CO.: Oils and greases for mines.

107 STANDARD OIL CO. (INDIANA): Line of lubricants and specialized products, including new line of coal-spray oils.

108 STEPHENS-ADAMSON MFG. CO.: Air-sand dry coal cleaner; system of Redler conveyor-elevators for conveying and elevating coal and other pulverized, granular, small-lump and flaky materials; JFS variable-speed reducer, Saco speed reducer with first reduction through adjustable V-belts.

109 STERLING PUMP CORPORATION: Deepwell turbine pumps.

110 SULLIVAN MACHINERY CO.: Sullivan "Super" shortwall cutter mounted on the "Two-Speed" self-propelled power truck; "Lohite" rock loader, with 15-h.p. 3-drum scraper hauler; new WK-79 mine-car compressor with air delivery of 85 cu.ft. per minute; car puller hoist; complete line pneumatic tools, tail rope sheaves for scraping; portable safety lighting cable.

111 SUN OIL CO.: Coalkote "C" and Coalkote "B" for dustless treatment of coal; special mine-car grease and full line of coal-mine lubricants.

112 SUPERIOR CARBON PRODUCTS, INC.: Motor and generator brushes for use on all types of electrical machinery in mines.

113 W. O. & M. W. TALCOTT, INC.: Belt fasteners, featuring special conveyor fastener for splicing conveyor belting of all widths and thicknesses; Talcott Acme patch fasteners for repairing torn or damaged belting.

114 TAMPING BAG CO.: Dummy-Maker and new type Seal-Tite fire-resistant tamping bags; reflex trip markers, signs, etc.

115 TEMPLETON, KENLY & CO.: Simplex mine jacks for coal-cutting and loading machines, rerailing mine cars and locomotives, cross timbering, car straightening, track work, post pulling, stretching heavy cable and trolley wire, tensioning chain hauls and conveyor belts; roof jacks; other jacks for various special mining purposes; new Nos. M-8 and M-16 mine roof jacks, rated at 8 and 16 tons, respectively; new No. 366 timber jack.

116 TENNESSEE COAL, IRON & RAILROAD CO. (See U. S. STEEL CORPORATION, No. 126).

117 TIDE WATER ASSOCIATED OIL CO.: "Tycol" oils and greases.

118 TIMKEN ROLLER BEARING CO.: Bearings and parts used in mining industry; rock bits for use in coal mines.

119 TOOL STEEL GEAR & PINION CO.: Complete line of gears and pinions for mining machines and locomotives.

120 BERTRAND P. TRACY CO.: Mining-machine cutter bars, chains and bits; parts for mining machinery.

121 W. S. TYLER CO.: Improved Type 400 electric screens for fine-coal screening; Ty-Rock screens for coarser-mesh screening; woven-wire screen cloth.

122 UNION CARBIDE & CARBON CORPORATION (joint exhibit of Linde Air Products Co., National Carbon Co., (Carbon Sales Div.) and Haynes Stellite Co.): Linde Air Products featured welding and cutting blowpipes, various applications of oxyacetylene process, and Miner's Lamp, Union Carbide; National Carbon Co. displayed electric motor brushes and other carbon products, including Karbate pipe, fittings, valves, and carbon brick; Haynes Stellite Co. stressed hard-facing applications to increase life of wearing surfaces, such as application of Haynes Stellite alloy and Haystellite tube rod to cutter bits.

123 UNION WIRE ROPE CORPORATION: Wire ropes of various types.

124 U. S. BUREAU OF MINES: Hydrogenation of coal.

125 UNITED STATES RUBBER CO.: U. S. Royal mining-machine cable with triple-tempered rubber; U. S. Royal tires.

126 UNITED STATES STEEL CORPORATION (joint exhibit of United States Steel subsidiaries, including American Bridge Co., American Steel & Wire Co., Carnegie-Illinois Steel Corporation, Columbia Steel Co., National Tube Co., and Tennessee Coal, Iron & Railroad Co.): Four new steel room timbers shown by Carnegie-Illinois Steel Corporation, also Cor-Ten, the high-tensile corrosion-resistant steel which reduces weight of mine cars; Cor-Ten, Man-Ten, and special abrasion-resisting A-R steel for chutes and mine screens where strength and wear resistance are essential; copper steel Duroline pipe, and other tubular products of National Tube Co.; rail bonds, Amerclad rubber-covered electrical wires and cables, "Tiger-Brand" hoisting and other wire rope, Laughlin safety clips for wire rope, "Excellay" preformed wire rope, aerial tramway waste-disposal systems, and the new conducting rubber developed by American Steel & Wire Co.

127 VIKING MFG. CO.: Viking dual system for dustproofing coal with heavy oils or wax blends; cabinet for dust determinations.

128 WATT CAR & WHEEL CO.: Blueprints and pictures of the latest-type 2-way automatic side-dump mine car of 8-wheel double-truck type; also rubber-covered powder box.

129 WEIR KILBY CORPORATION: Mine-track equipment, featuring Weir-Titan frogs, switchstands, rail braces, switch clips, spring connecting rods, compromise joints, guard rails, etc.

130 WESTERN CARTRIDGE CO.: Blasting caps.

131 WESTINGHOUSE ELECTRIC & MFG. CO.: New type 300-kw., 275-volt portable Ignitron mercury-arc rectifier of 46 in. over-all height; also a d.c. general-purpose industrial motor, and several d.c. controls of the newest types, among which is an explosion-tested control of special application in coal mines.

132 WEST VIRGINIA GEOLOGICAL & ECONOMIC SURVEY: West Virginia coals.

133 WEST VIRGINIA RAIL CO.: Complete line of trackwork, including all standard designs of mine ties, among which is a special tie with self-locking clip. A recently redesigned clip incorporating changes which make the tie even more convenient to install was shown; also, safety rail frog, with full line of rails and rail joints and high-speed light-weight rail benders.

134 WHEAT LAMP SALES, INC.: Lightweight, rechargeable battery lamps for every lighting purpose and general line of electric cap lamps and Koehler flame safety lamps; new government-approved light-weight electric cap lamp with direct contact, push-turn charging, allowing for complete self-service.

135 WOOD PRESERVING CORPORATION (See KOPPERS CO., No. 62).

Circle on the card below the numbers of the companies on which additional information is desired. No obligation. The card requires no postage.

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Date.....

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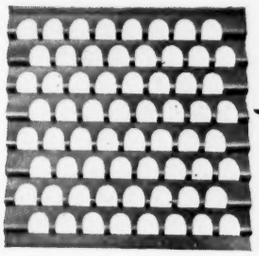
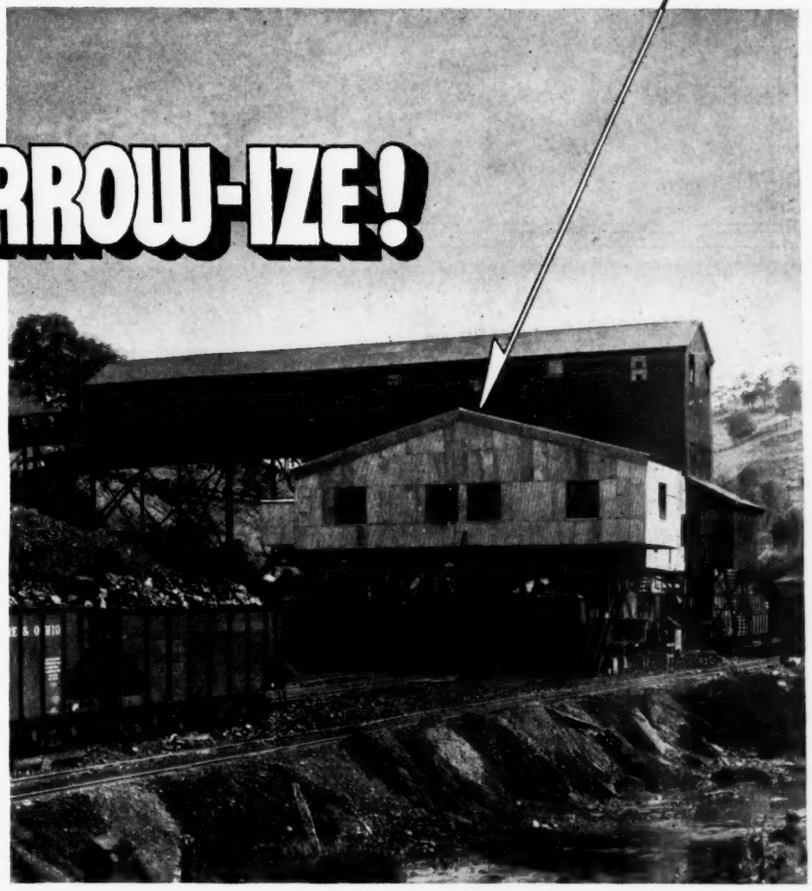


from the SMALLEST REPLACEMENT to a COMPLETE TIPPLE INSTALLATION

it pays to MORROW-IZE!



25 years of specialization make MORROW the recognized engineering authority of the coal industry for everything that is latest and best in coal preparation equipment.

Modern, efficient shaking and vibrating screens, picking tables, hoppers, conveyors, rotary dumps, chutes, loading booms, crushers, dryers, recirculators and washers, are just a few of the many important replacements that MORROW has furnished to alert operators during the past few months.

The complete engineering facilities of this experienced organization are always at your disposal.

"It pays to Morrow-ize."

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MANUFACTURING CO. WELLSTON, OHIO

DESIGNERS AND BUILDERS OF COAL HANDLING EQUIPMENT FOR OVER 25 YEARS

INCREASE PRODUCTION IN LOW COAL . . .

Equip your men with form fitting Knee Protectors!

THE EZYON KNEE PAD

• Increase your miners' comfort in low coal, and in doing so, *increase your production* with EZYON Knee Pads. Light in weight (only 10 oz.) they are made of live, flexible, *durable* rubber and a thick sponge rubber kneeling surface. Can be worn all day with no discomfort. Easy to put on . . . easy to take off . . . they keep the clothing dry. Wear them kneeling, standing, walking . . . their form fitting construction allows for complete freedom of movement. Contact your nearest distributor—he'll be glad to provide you with EZYON Knee Pads.

DISTRIBUTORS WANTED

We will gladly send EZYON Knee Pad samples to responsible distributors upon receipt of name, address and title.

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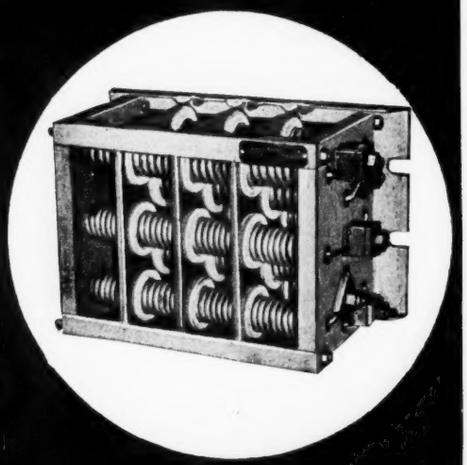
RESISTANCE FOR PROFITS

Equip your locomotives and mining machines with **G.M.C. RESISTANCE UNITS!**

Built to carry heavy overloads, these G.M.C. Resistance Units start smoothly, accelerate properly, and withstand heavy abuse. They allow free circulation. G.M.C. Resistance is made to fit any type of locomotive or mining machine. Let us tell you more about it!



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FOR THE LATEST G. M. C. BULLETINS

GUYAN MACHINERY COMPANY

LOGAN · · · WEST VIRGINIA

(Continued from page 94)

a sufficiently dense cloud of dust to be ignited by the flame of the black blasting powder," it said.

The report enumerates a number of lessons learned from the disaster and makes various recommendations for correction of conditions in the mine which the investigators considered unsafe. It points out that there was unanimous agreement that black blasting powder initiated the explosion and states that "the use of black blasting powder is a hazard in any coal mine." Black blasting powder has been condemned by the Bureau for many years, and some States prohibit its use. "This explosion is one of four very bad disasters which have occurred in the last four years in bituminous mines in the United States in connection with blasting in mechanized mines. Unquestionably blasting in mechanically operated mines requires much more safeguarding than it now has."

Recommendations in the report include:

1. That the mine should be operated as a gassy mine and proper precautions taken.
2. Certain changes should be made in the ventilation system, including the placing of all haulageways on intake air.
3. Abandoned or worked-out sections of the mine should be sealed off.
4. The use of black blasting powder should be discontinued.
5. Permissible explosives should be used and only competent shotfirers should be permitted to handle them. Only one day's supply of explosives should be kept underground.
6. Water should be used on mining machines, loading machines, before and after blasting and on loaded and empty cars to allay coal dust. All working places should be kept thoroughly wetted.
7. Proper rock-dusting should be practiced.
8. Electrical equipment used at or near the face of workings should be of permissible type.
9. Selected employees should be given training in the use and care of oxygen breathing apparatus and in rescue and recovery operations.

•

Prepare for Power Show

Preparations are under way for the fourteenth National Exposition of Power and Mechanical Engineering, to be held Dec. 2-7 at the Grand Central Palace, New York City. This year's "Power Show" is expected to attract an audience of more than 40,000 persons interested in equipment for the most economical generation, distribution and utilization of power. Already more than 200 leading concerns have engaged exhibition space, with indications that the remaining choice locations will go rapidly.

The exposition advisory committee includes: I. E. Moultrop, chairman; John H. Lawrence, vice chairman; Comfort A. Adams, E. G. Budd Mfg. Co.; Homer Addams, past president, American Society of Heating and Ventilating Engineers; J. T. Barron, Public Service Electric & Gas Co.; R. E. Dillon, Boston Edison Co.; Fred Felderman, past national president, National Association of Power Engineers; A. C. Fieldner, chief, Technologic Branch, U. S.

The war of the floors is settled by rubber

A typical example of Goodrich development in rubber

MORE temperamental than any skating star, the floors in a modern rink are forever battling with each other. Turn on the refrigerant to freeze the rink and that floor shrinks with the cold. Turn on the heat in the room to warm the spectators and the outer floor, surrounding the rink, expands.

To prevent buckling and cracking from this war of the floors, they were separated by a trench filled with asphalt to take up the expansion and contraction. But when the whole room was used for a dance or an exhibition and so was heated, both floors expanded and the asphalt swelled up and spilled over in a sticky annoying mass.

A Cleveland engineer heard that Goodrich had a rubber expansion joint for use in concrete highways. Why wouldn't it work in floors? He tried it in a municipal auditorium he was building. It worked perfectly — when both floors expand, the rubber deflects downward and leaves its surface flush with both floors. When floors contract, the rubber resumes its original position and is still flush. You'd have to look twice to see where one floor ends and the other begins, and there hasn't been a single crack nor a penny spent in floor maintenance.

This Goodrich Expansion Joint Filler is one more example of how Goodrich research is constantly improving the efficiency and life of the tools of industry. Every Goodrich product and every Goodrich user benefit by this practical, constant research development.

The B. F. Goodrich Company, Akron, Ohio.

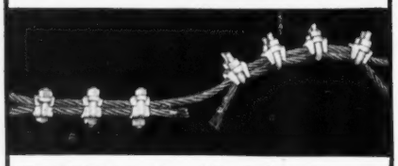
Goodrich

ALL *products problems* IN RUBBER

(Another story of Goodrich development appears on page 1)

THERE'S NO CRIMPING WITH THIS CLIP — IT GRIPS LIKE A FIST!

The Laughlin drop forged Safety Clip grabs wire rope with a grip like a fist—a vise-like, solid clench that *stays put*. When removed, it leaves the wire rope straight, uncrimped, ready to use again.



FOOLPROOF. Laughlin Safety Clips are easier and safer to apply. They can't be put on wrong. No fussing or waste of time. And three Laughlin Safety Clips will do the job of four ordinary U-Bolt Clips.

DOUBLED EFFICIENCY. Tests recently made by a leading engineering school prove Laughlin Safety Clips 50% more efficient than ordinary U-Bolt Clips.

FREE BULLETIN TELLS MONEY-SAVING FEATURES OF LAUGHLIN SAFETY CLIPS

These tests are described in a new booklet — which also gives other advantages to be gained by using Laughlin Safety Clips. Fill out the coupon below — and mail today. No obligation.

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Portland, Maine

Please send me free Safety Clip booklet C-5.

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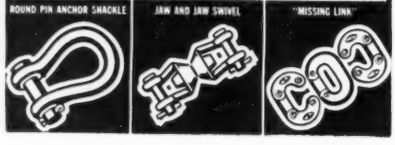

Bureau of Mines; N. E. Funk, Philadelphia Electric Co.; F. E. Giesecke, president, American Society of Heating and Ventilating Engineers; G. E. Hulse, president, American Society of Refrigerating Engineers; George L. Knight, Brooklyn Edison Co.; David Moffat Myers, consulting engineer; Joseph Pope, Stone & Webster Engineering Corporation; Arthur L. Rice, editorial director, *Power Plant Engineering*; Philip W. Swain, editor, *Power*; Alfred Vaksdal, Corning Glass Works; Charles F. Roth, manager, and E. K. Stevens, associate manager of the exposition.

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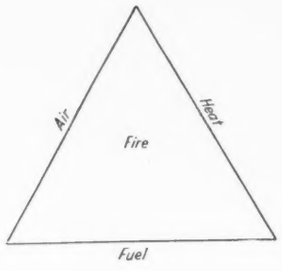
Fire and Explosion Hazards and Control Explained Before Illinois Group

A DEMONSTRATION of fire and explosion hazards and control was staged by C. A. Herbert and Alex U. Miller, of the U. S. Bureau of Mines, Vincennes, Ind., at the monthly meeting of the Mining Electrical Group of Southern Illinois held May 10 at West Frankfort, Ill. In introducing the subject Mr. Herbert said: "Civilization is based on the knowledge, control and results from fire." He pointed out that it is through the medium of heat that we are able to produce power, many raw materials, and fabricate our machines, adding: "generators, explosives, internal combustion engines—these are the instruments of civilization and destruction; servants if controlled, but with dire results if allowed to get out of bounds."

To have a fire, he continued, there must be fuel, air and heat—a fuel being defined as anything that will burn. The accompanying diagram, said Mr. Herbert, "represents the essential conditions to permit fire"—it is the triangle of action. If any leg of the triangle be omitted, there can be no fire. Moreover, in the case of inflammable gases, ignition and the nature of the fire depend on the relative percentages of gas and air. To ignite a mixture and have an explosion, the percentage of gas must be within certain limits: for gasoline, 2 to 6 per cent; for methane, between 5½ and 13 per cent by volume. Lesser percentages of gas do not ignite at all; greater percentages will merely burn if the mixture be brought into contact with more air.



In the matter of safety in storing and handling oils, gasoline and other liquids which give off inflammable vapor, Mr. Herbert demonstrated that gasoline in the open or filling a can does not explode, but merely burns, because the surrounding mixture of air and vapor is above 6 per cent in richness. Explosions, he averred, "do not come from full or partly filled containers; empty barrels and cans are the things to look out for." He advised that "containers for handling and storing inflammable fluids be fitted with a relief device so that internal pressure cannot be built up, and that the vent be covered with a wire gauze so that flame shall not pass. Sufficient heat may cause pressure explosions, as in the case of a steam boiler."

Mr. Herbert condemned the practice of cleaning machinery parts with gasoline, insisting that hot caustic soda solution is more effective—and safe—for gasoline vapor is 2½ times as heavy as air and will flow along the floor, as water does, for a long distance to reach a fire that may set it off. He cited the recent case of a Centralia (Ill.) oil well where vapors spread from the well and finally reached a kitchen stove, causing six men to lose their lives.

As means for the control and extinguishment of fires Mr. Herbert listed: (a) water; (b) rock dust—one of the best for heavy fires; (c) Pyrene—for incipient fires; (d) carbon dioxide; the last two suitable for electric fires because non-conductors. In response to an inquiry, he stated that rock dust extinguishes dust explosions by dilution and by absorption of heat, and added that rock dust should constitute 50 per cent of the mixture.

A series of experiments demonstrated the ignition of explosive mixtures by electric spark and by red-hot conductors; also the safety of the permissible cap lamp and permissible motors. A temperature of 1350 deg. F. is required to ignite methane mixtures; there is a time lag between spark and ignition which may be shortened by heavier spark. In stressing the value of permissible motors as safe equipment Mr. Herbert warned that they must be kept permissible or they may be worse than open motors because considered safe when they are not.

Asked for a testimonial on permissible mining equipment, C. C. Conway, electrical engineer for the Consolidated Coal Co., said most of his company's motor and control purchases during the last ten years had been of the permissible type, and he had found maintenance cost lower and the control almost free from meddlesome tinkering by operatives.

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Personal Notes

ANGUS R. BROWN, hitherto chief inspector of the coal mines division, Tennessee Coal, Iron & Railroad Co., has been appointed superintendent of ventilation.

RAY ELLIS, director of the mine-rescue division of the State Department of Mines in five southern West Virginia counties, has

"*This advanced lubrication service helped us* reduce operating costs"

. . . Say Operating Officials

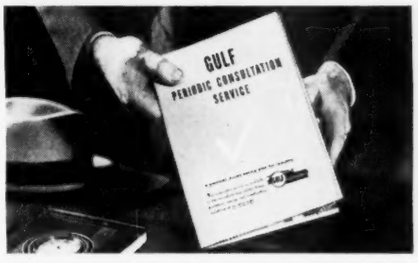
GULF PERIODIC CONSULTATION SERVICE

gives you a practical cost-reducing tool you can put to work at once!

HOW to offset mounting "non-controllable costs" — that's the perplexing problem executives and operating men are facing today.

Here is a practical cost-reducing tool you can put to work in your plant that will help you cut controllable costs and offset the higher non-controllables. Through this modern lubrication service, you get the benefits of the advanced knowledge and skill which Gulf's large staff of technologists has developed during recent years. *Without one cent of additional investment,* you are assured that efficient operation of your machinery is maintained and costs for maintenance held down to a minimum.

For the operating official who is seeking a means to reduce costs and increase profits, here is something *definite* that can be done — at once! Write for your free copy of the booklet which explains this money-saving service.



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Please send my copy — no charge — of the booklet "GULF PERIODIC CONSULTATION SERVICE."

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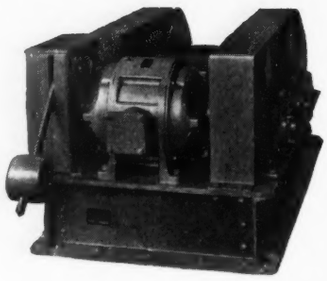
THE BROWNIE



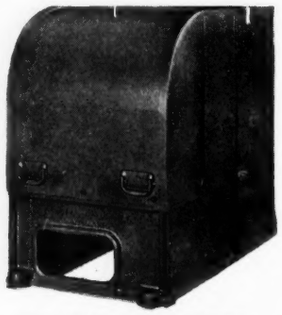
LAYER LOADING HOIST

The better the product, the easier it is to market, the lower the sales cost, the bigger profits . . . that, in a nutshell, is how this "Brownie" HOIST can help you make more money when used for layer loading. Modern preparation plants use this better loading method to eliminate an excess of desirable or inferior coal in any single car; avoid segregation of lump from fines; and reduce degradation. One of the three different sized "Brownie" hoists designed for such service assures excellent results. Why not let us explain this application in detail . . . and send literature describing other items in the line for increasing *preparation* profits?

●

and Also for Service Above Ground

OIL SPRAY PUMP



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MINE CARS AND WHEELS
HOISTS PUMPS
BLOWERS SHEAVES
OIL SPRAY SYSTEMS
RETARDERS RERAILERS

THE BROWN-FAYRO COMPANY
940 ASH ST. JOHNSTOWN, PA.

Permissible Plates Issued

Six approvals of permissible equipment were issued by the U. S. Department of Mines in April, as follows:

Goodman Mfg. Co.: Type 95-R-24 belt conveyor; 7½-hp. motor, 230 volts, d.c.; Approval 396; April 3.

Goodman Mfg. Co.: Type 460 BH loader; two motors, 50 and 4 hp.; 250 volts, d.c.; Approval 381; April 4.

Fairmont Machinery Co.: Black Diamond loader; 30-hp. motor, 500 volts, d.c.; Approval 397-A; April 10.

Joy Mfg. Co.: Type U-245E coal drill; 3-hp. motor, 250 volts, d.c.; Approval 398; April 11.

Joy Mfg. Co.: Type 14-BU loader; two 7½-hp. and three 4-hp. motors, 250 and 500 volts, d.c.; Approvals 399 and 399A; April 27.

Goodman Mfg. Co.: Du Pont hydraulic cartridge pump; two motors, 15 and 7½ hp., 250 volts, d.c.; Approval 406; April 27.

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resigned that position, effective June 1, to accept an offer to become safety engineer for the Pond Creek Pocahontas Co., Bartley, W. Va.

James C. Gray, heretofore superintendent at Wylam mine of the Tennessee Coal, Iron & Railroad Co., Fairfield, Ala., has been made chief inspector of the company's coal mines division, vice Angus R. Brown, promoted.

N. B. Gurley, for many years chief engineer for the Red Jacket Coal Corporation, Red Jacket, W. Va., has joined the sales staff of the West Virginia Rail Co. He has the West Virginia territory for the company, with headquarters in Huntington, W. Va.

Marshall John H. Jones, president, Jones Collieries, Inc., Rachel, W. Va., has been elected a director of the Six States Coal Corporation, Pittsburgh, Pa., a wholesaling organization. M. F. McDermott has been elected president.

William M. Lacey, formerly superintendent at the Edgewater mine of the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., has been transferred to the Wylam mine in a similar capacity, vice James C. Gray, promoted.

Robert F. Lambie, formerly chief of the West Virginia Department of Mines, has been made president of the Wheat Lamp Sales Co.

Joseph E. Lewis, formerly superintendent at Stotesbury Nos. 5 and 8 mines of the Koppers Coal Co., Stotesbury, W. Va., has been appointed superintendent of the Brule Smokeless Coal Co., Otsego, W. Va., vice R. A. Suppes.

James Nichol, Jr., formerly connected with the Sayreton mines, Republic Steel Corporation, Sayreton, Ala., has been appointed assistant superintendent of mines at all operations of subsidiaries of the National Coal & Coke Co., in Alabama. He will supervise operations at Powhatan mine, Franklin Coal Mining Co., and Bankhead

Coming Meetings

- Stoker Manufacturers' Association: annual convention, June 6 and 7, Hot Springs, Va.
- Rocky Mountain Coal Mining Institute: annual meeting, June 6–8, Cosmopolitan Hotel, Denver, Colo.
- Big Sandy-Elkhorn Coal Operators' Association: annual meeting, June 7, Ashland, Ky.
- Illinois Mining Institute: 22d annual boat trip and summer meeting, aboard Str. "Golden Eagle," leaving St. Louis June 7 and returning June 9.
- West Virginia Coal Mining Institute: annual meeting, June 14 and 15, West Virginia Hotel, Bluefield, W. Va.
- American Society of Mechanical Engineers: semi-annual meeting, Milwaukee, Wis., June 17–20; Berkeley-Carteret Hotel, Asbury Park, N. J., June 19–22; University of Michigan, Ann Arbor, June 20–21.
- Mining Society of Nova Scotia: annual meting, June 20 and 21, Sydney and Glace Bay, N. S.
- Appalachian Coals, Inc.: 26th fuel engineering conference, June 21, Shoreham Hotel, Washington, D. C.
- American Society for Testing Materials: 43d annual meeting, June 24–28, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J.
- Southern Wyoming Coal Operators' Association: annual meeting, July 9, Cheyenne, Wyo.
- Sixth Annual Southern Appalachian Industrial Exhibit: Aug. 22-24, Norfolk & Western Freight Terminal, Bluefield, W. Va.

Nos. 1 and 2 mines and Summit mine, Alta Coal Co.

COL. EDWARD O'TOOLE, formerly general superintendent of the United States Coal & Coke Co., Gary, W. Va., has entered the motion picture industry with a new enterprise, the Colonnade Pictures Corporation, Miami, Fla., of which Miss Anna O'Toole is president.

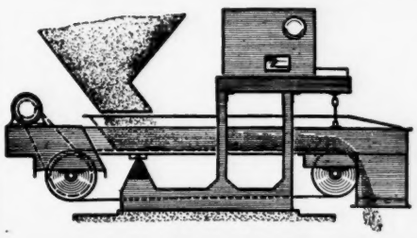
G. MOSS PATTERSON has been appointed chief mine inspector and head of the State Department of Mines and Minerals of Kentucky to succeed JOHN F. DANIEL, resigned. Mr. Patterson has been a mine superintendent and engineer in Harlan and Bell counties for the last fifteen years. Mr. Daniel was head of the department for many years. No reason was given for his resignation.

J. D. ROGERS, vice-president, Stonega Coke & Coal Co., has been elected president of the Virginia Coal Operators' Association. Other officers named are: vice-president, CHARLES E. RALSTON, general manager, Benedict Coal Corporation; secretary-treasurer, GEORGE H. ESSER; assistant secretary-treasurer, E. H. ROBINSON.

PAUL L. SHIELDS, assistant general manager, United States Fuel Co., has been elected president of the Utah Coal Operators' Association; vice president, L. E. ADAMS, vice president, Spring Canyon and Royal coal companies; executive secretary, B. P. MANLEY.

RALPH B. WATT, formerly assistant superintendent at the Edgewater mine of the

WEIGHTOMETER



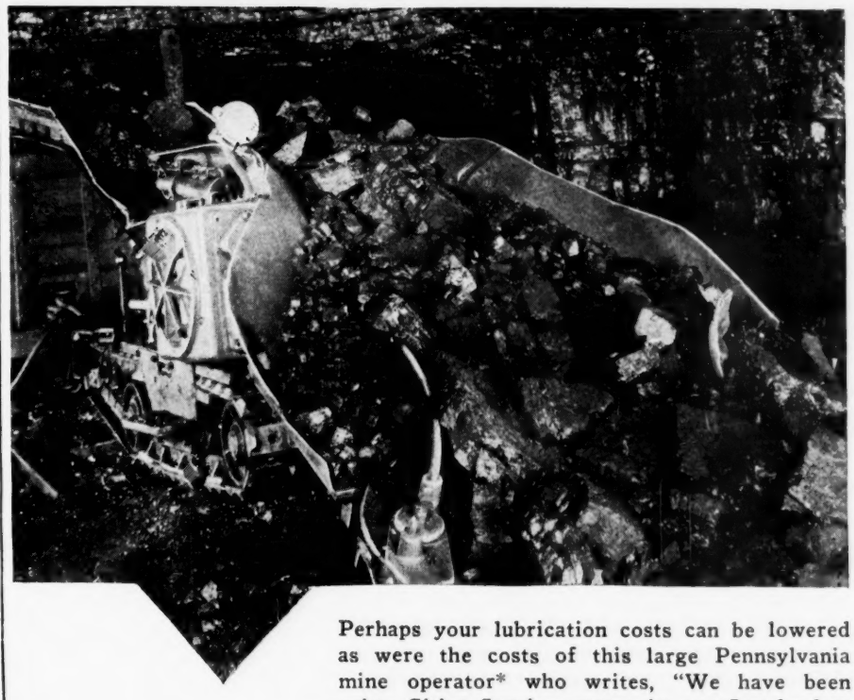
—when space is limited . .

Use this self-contained conveying and weighing space saving unit. The forward (or head end) is suspended from a scale lever system, connected to the WEIGHTOMETER. The loading end of the conveyor rests on a fixed pivot. Conveyor can be kept within a few feet in length. Supplied for large or small tonnages. Let us show you how to check your tonnage accurately, at low cost, with a Merrick WEIGHTOMETER.

BULLETIN 375

MERRICK SCALE M'FG. CO., Passaic, New Jersey

WHAT PRICE MINE LUBRICATION?



Perhaps your lubrication costs can be lowered as were the costs of this large Pennsylvania mine operator* who writes, "We have been using Cities Service grease in our Joy loaders and have found it very satisfactory. We have gone into the cost of lubrication with people from other districts and from their comments we believe our costs are very well in line."

The same operator writes, "Your engineers' service has been everything we might ask, they are at all times cooperating with us."

Investigate Cities Service "Service Proved" Lubricants and our Engineering Service. Fill in the enclosed blank and mail today.

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Just mail the coupon

* Name furnished on request.

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Sixty Wall Tower, N. Y.
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Please Have a Lubrication Engineer Call

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Company Address.....

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SERVICE PROVED INDUSTRIAL OILS

"INSTALLED IN 1932, This STERLING Turbine Pump IN PERFECT CONDITION TODAY!"

Read This Excerpt From A Letter of J. L. Biddle, Supt. of Maintenance, WESTVACO CHLORINE PRODUCTS, INC.

"We installed the first Sterling Turbine Pump in 1932 at 500' setting. This pump has been in continuous service since that date except when we pulled the well to inspect the pump and lower pump to 700' setting. On May 26, this year (1936), we again pulled this pump to inspect it, and again found it to be in perfect shape.

"Since 1932 we have installed many more of the same type of Sterling pumps . . . we are 100% sold on them!"

Such a statement by a man of authority who has no personal axe to grind should mean much to you who have coal mine dewatering problems. Write for full details, catalogs and prices—today.

Few Sterling Pump owners need service—but if you need it, Sterling offers the highest class of service from coast to coast.

PRECISION BUILT

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SCRANTON, PA. Scranton Electric Construction Co.

PITTSBURGH, PA. Bushnell Machinery Co.

KNOXVILLE, TENN. Tennessee Mine & Supply Co.

DENVER, COLO. Thompson Manufacturing Co.

And In All Principal Cities

Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., has been made superintendent, vice William M. Lacey, transferred.

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Fuel Engineers Outline Program Of Bituminous Research

Details of a broad cooperative program of scientific research to capture new and regain old markets for bituminous coal for midwestern producing companies, as outlined at a Chicago conference of fuel engineers representing many companies of that area, were disclosed on April 26. This is part of a nation-wide program which is being sponsored by Bituminous Coal Research, Inc., an affiliate of the National Coal Association, said E. R. Kaiser, assistant to the president of the research agency.

Problems embodied in the program are: smokeless hand-firing of coal, completely automatic residential heating, dustproofing of coal, railroad locomotive fuels, publication of engineering bulletins, a standard smokiness index, modification of ash fusion characteristics, and emission of solids from stokers. It was further urged that B.C.R. coordinate research on coal throughout the country and keep executives and engineers of the coal industry constantly informed on trends in coal utilization and research by publication of periodical digests and engineering bulletins.

To heat residences with coal, minus the customary three-times-a-day firing and tedious removal of ashes, requires the development of stokers with both automatic bin feed and ash removal. The equivalent in a gasification unit whereby the coal can be converted into a gaseous form, which is most suitable for many uses, is another possibility. Recent researchers in Great Britain have had marked success with this.

Improved low-priced stoves and better central heating furnaces are proposed for burning high-volatile coal smokelessly where coal is hand-fired in residences and small buildings. The production of fly ash and smoke with conventional residential stokers is to be thoroughly investigated for possible means to eliminate it completely. Further studies of "dustless" coals were urged. This includes research to perfect better methods and materials for dustproofing coals at low cost, a study of the effect of dustproofing treatment on the weathering of coal, and the development of an accelerated test of effectiveness of treatment. To reduce the difficulties with ashes of low softening temperatures an investigation of the uses of mixtures of materials with coal also is contemplated.

Funds for the research program are being pledged by coal operators throughout the country. Each producer's pledge is based upon a one-third mill levy per ton of coal produced. The initial cost of the campaign is an annual research expenditure of $40,000 for a three-year period. According to officials of Bituminous Coal Research, more than 75 per cent of this already has been pledged.

Fuel engineers in attendance at the Chicago session included: F. H. Bird, Binkley Coal Co.; T. B. Blair and R. C. Rasmussen, Bell & Zoller Coal & Mining Co.; J. Stephen Bond, Franklin County Coal Corporation; Andrew J. Cassell, Deep Vein Coal Co.;

R. E. Fagerburg and S. H. Viall, Chicago, Wilmington & Franklin Coal Co.; H. W. Graham, United Collieries Co., Inc.; Joseph H. Harrington, Northern Illinois Coal Corporation; Howard A. Herder, Sahara Coal Co.; Allen Jensen and V. G. Leach, Peabody Coal Co.; C. N. Lammers, Chicago & Eastern Illinois Railway Co.; John W. Lucas, Old Ben Coal Corporation; A. C. Smith, Consolidated Coal Co.; Gordon Smith, Republic Coal & Coke Co.; Walter H. Brackman, Kansas City Coal Service Institute; C. G. Lang, consulting engineer; C. Y. Thomas, Pittsburg & Midway Coal Mining Co., and M. A. Tuttle, Knox Consolidated Coal Corporation. Bituminous Coal Research, Inc., was represented by President Howard N. Eavenson; Mr. Kaiser, Secretary C. A. Reed, and two directors: B. R. Gebhart, Chicago, Wilmington & Franklin Coal Co., and John A. Howe, Truax-Traer Coal Co.

•

Business Paper Editors Elect Wooton

Paul Wooton, Washington bureau chief for the McGraw-Hill Publishing Co., Inc., was elected president of the National Conference of Business Papers Editors at a meeting held in the Hotel Willard, Washington, April 19. At the same time it was announced that the next Washington meeting would be held June 13 and 14. Other officers chosen were: secretary-treasurer, James G. Lyne, assistant to editor, *Railway Age;* eastern vice president, Sidney D. Kirkpatrick, editor, *Chemical & Metallurgical Engineering;* western vice president, Frank G. Steinebach, editor, *The Foundry.*

•

New Preparation Facilities

Alabama By-Products Corporation, Barney mine, Cordova, Ala.: Contract closed with McNally-Pittsburg Mfg. Corporation for one McNally-Norton compound automatic washer for treating 3x0-in. coal; capacity, 350 tons per hour; to be installed in existing plant and classification of coal after washing to be made as at present; to be completed about July 15.

Benedict Coal Corporation, Virglow mine, St. Charles, Va.: Contract closed with American Coal Cleaning Corporation for one American pneumatic coal-cleaning plant consisting of one 5x18-ft. "Twin-Dex" type pneumatic separator and auxiliary equipment to clean 85 tons per hour of 2½x0-in. raw-coal input; to be completed about June 1.

Black Creek Coal & Coke Co., Trafford, Ala.: Contract closed with Deister Machine Co. for No. 16 Deister "Plat-O" coal-washing table to clean ½x0-in. coal at an estimated capacity of 15 tons per hour; addition to existing equipment.

Clayton Coal Co., Clayton, Colo.: Contract closed through Eaton Metal Products Co. for design and equipment by Robins Conveying Belt Co. for tipple to handle and screen mine-run coal into lump, egg, pea, modified pea and slack, as well as combinations thereof; equipment to include one weigh basket, one shaking feeder, one shak-

Cutaway View of Dog, showing grip cannot slip. No loose parts to be misplaced or lost.

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of Operators

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Where desired the knock-off block is provided so that miner can release and remove prop at a safe distance where there is danger of falling rock.

Made in Six Standard Heights

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Show visitors at Cincinnati were enthusiastic in approving the Markham Adjustable Safety Mine Prop. It is the only practical, Fast, Safe, Adjustable, Temporary Roof Prop. For any height roof. Set as quickly as miner ordinarily takes to use "slide rods" determining length of timber. We appreciate the enthusiastic acclaim shown Markham Adjustable Mine Props . . . which we believe is a tribute to their service and economy.

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Check these production-plus features of the new KOAL-MOBILE!

Four Wheel Drive

Offers maximum tractive effort to meet severe starting and grade conditions, and at the same time minimizes road bed disturbance by distributing tractive effort.

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Decreases operating difficulties—allows turns on an 8 foot inside radius. Increases safety under every condition.

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Insures a Torsion free frame and body. Provides maximum roadability.

The KOAL-MOBILE may be cable reel or battery powered. Has a 2 speed magnetic control, and dual car steering control enables the operator to always face in the direction of travel. Comes in capacities of 2 to 10 tons. For *complete details* about KOAL-MOBILE, *Write today!*

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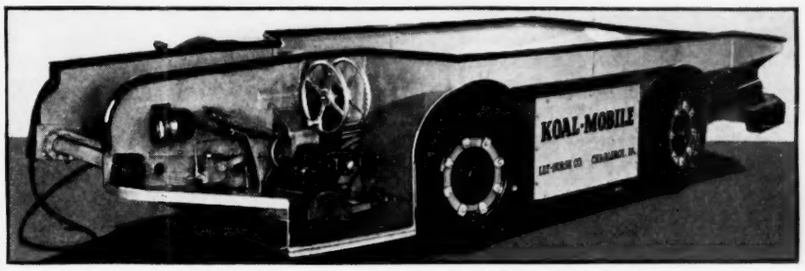

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Air clean your coal

the **STUMP** *way*

- **Some large tonnage users of the Stump Process are:**

Bell and Zoller Coal Mining Company	Ziegler, Ill.
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Heisley Coal Company	Nanty Glo, Pa.
Island Creek Coal Company	Holden, W. Va.
Monroe Coal Mining Company	Revloc, Pa.
Pickands Mather and Company	Mather, Pa.
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- ***Of all air cleaning plants built during the last five years ninety per cent have employed the Stump Process***

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Whatever your preparation needs may be, our engineers can find the proper answer.

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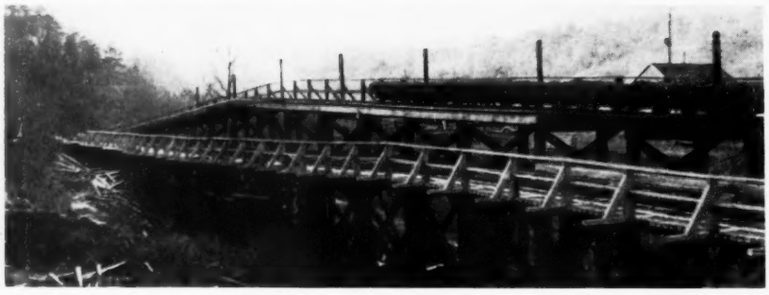
For **PERMANENT** *Structures*
Use **OSMOSE-TREATED** *Wood*



Return track trestle at one of Alabama's largest coal mines, rebuilt in 1938 with Osmose-treated pine timbers replacing sections where untreated timbers had failed. Osmose-treated timbers are identified by their lighter color in the photo.

SERVICE life of wooden structures above or below ground is increased from 3 to 5 times by the use of Osmose-treated wood. Osmose-treated mine ties and timbers last for many years in locations where untreated wood decays within a brief period. Osmose treatment requires no heat- or pressure-treating equipment whatever; it's as easy to apply as whitewash, yet penetration of preservatives is deep, effective and lasting; cost only a fraction of pressure-treating methods; applicable to any species of wood. Let us send you further details and testimonials from prominent mine operators.

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General Offices: 1437 Bailey Ave., Buffalo, N. Y.
Branch Office: Martin Bldg., Birmingham, Ala.

ing screen, five 48-in. belt conveyors, three 36-in. belt conveyors, two 30-in. belt conveyors, three 24-in. belt conveyors, one 18-in. belt conveyor; one 30-in. scraper conveyor, three 24-in. scraper conveyors, two 8-in. drag scraper conveyors, one pick breaker, one 60x144-in. double-deck "Gyrex" screen; maximum flow rate, 300 tons per hour; to be completed about Sept. 1.

KENT COAL MINING Co., Kent mines Nos. 1 and 2, McIntyre, Pa.: Contract closed with Heyl & Patterson, Inc., for additional coal screening and crushing equipment loading $3\frac{1}{2}$x2-in. egg, 2x$\frac{3}{4}$-in. stoker, and $\frac{3}{4}$x0-in. slack; capacity, 420 tons per hour; to be completed about July 1.

MONONGAHELA RAIL & RIVER COAL CORPORTION, Emily mine, Maidsville, W. Va.: Contract closed with Roberts & Schaefer Co. for complete tipple with hydro-separator coal washer; lump to be crushed and 5x$\frac{3}{8}$-in. to be washed; capacity, 250 tons per hour of mine-run; four sizes to be loaded onto four tracks: 5x$1\frac{1}{2}$ egg, $1\frac{1}{4}$x$\frac{3}{4}$ nut, $\frac{3}{4}$x$\frac{3}{8}$ pea, and $\frac{3}{8}$x0 slack; plant to be completed July 1.

PENNSYLVANIA COAL & COKE CORPORATION, Cresson, Pa.: Contract closed with Fairmont Machinery Co. for construction of new tipple and cleaning plant equipped with 10-ft.-diameter Chance cone to wash 200 tons per hour of 4x$\frac{3}{8}$-in. coal; mine-run capacity, 400 tons per hour; when completed, the tipple and washer will be able to make a large combination of sizes.

SLAB FORK COAL Co., Slab Fork, W. Va.: Contract closed with Robins Conveying Belt Co. for remodeling existing tipple, with new equipment consisting of one two-speed shaking pan feeder; one 36-in. inclined slope conveyor 1,060 ft. long and 300 ft. high when lifted, to handle coal and slate at rate of 300 tons per hour and 350 ft. per minute; one 36-in.x65-ft. reversible declined cross conveyor to handle either coal or slate, and one 36-in.x133-ft. inclined slate conveyor; to be completed about Sept. 1.

•

Movie Shows Wire-Rope Making

Bethlehem Steel Co., which added the manufacture of wire rope to its activities three years ago, is completing a motion picture on the making and use of this product. With the acquisition in 1937 of the Williamsport Wire Rope Co., Williamsport, Pa., Bethlehem became one of the few manufacturers of wire rope having its own steel-making facilities. Changes and improvements to increase the capacity and efficiency of the Williamsport plant during the last year include addition of a new cleaning unit used in the preparation of rod for drawing into wire. A number of additions of equipment and changes in existing machines have been made, and several new rope-making machines have been installed, increasing capacity for the larger sizes.

Beginning with the handling of the iron ore, the picture, "Sinews of Steel," will show the principal operations in steel making, with particular emphasis on the fact that steel for wire rope is made especially to meet the requirements of that

product. The rolling of rod from the billet on high-speed continuous mills and the processing of rod into wire for making into rope are covered in detail. Close-ups and sectional views show the drawing of wire to the smallest sizes.

•

To Adjust War-Time Mine Wages On Living-Cost Basis

Agreement has been reached between the Western Canada Bituminous Coal Operators' Association and District 18, United Mine Workers, whereby wage adjustments will be made and bonuses given for the duration of the war and a year afterward through a federal government cost-of-living commission. This arrangement, announced by Angus J. Morrison, secretary-treasurer of district 18, U.M.W., affects about 9,000 miners in Alberta and British Columbia. Mr. Morrison also is Labor member of the Alberta Legislature for Edson.

The federal government has agreed to set up a cost-of-living commission to be headed by Prof. G. E. Britnell of the University of Saskatchewan, said Mr. Morrison. In addition there will be a representative of the coal owners and one for the U.M.W. on the commission. All present wage agreements will be retained, continued Mr. Morrison, and bonuses will be paid as may be found necessary on the advance of living costs, the rate as of March 31, 1938, being accepted as the basis for adjustments.

Work by the commission is to begin within a few days and a further revision is to be made Sept. 1. Subsequent revisions are to be made at four-month intervals if the cost of living should fluctuate 5 per cent or more during those periods.

•

Sayers Named Bureau Director

Nomination of Dr. Royd R. Sayers to become director of the U. S. Bureau of Mines was sent to the Senate at Washington on May 13. The former senior surgeon of the Public Health Service was appointed acting director of the Bureau of Mines by President Roosevelt, on recommendation of Secretary of the Interior Ickes, early in April (*Coal Age*, May, p. 72). Born in Crowtherville, Ind., in 1885, Dr. Sayers is a graduate of Indiana University.

•

Ready for Illinois Boat Meeting

Illinois Mining Institute members attending the summer meeting will hear four papers of interest to the industry. Sessions will be held aboard the Steamer "Golden Eagle," which will leave St. Louis at 10:30 p.m., June 7 and return at 7 a.m., June 9. Following an address of welcome by Roy L. Adams, president of the institute, these papers will be presented: "Relations of the Development in Illinois Coal Fields to the Hazards of Coal-Mine Operations," William J. Johnson, State mine inspector, Tenth inspection district, Christopher, Ill.; "Coal Cleaning and Preparation," F. A. Lyons, Pyramid Coal Corporation; "Underground Trucking," H. C. McCollum, Allen & Garcia Co.; "Modern

THE *SuperDuty* COAL WASHING TABLE

OFFERS PHENOMENAL CAPACITY—Increased capacity, running as high as 400% on some coal cleaning jobs, strikes a phenomenally high average over capacities recently accepted as optimum.

EASILY EXCELS IN WASHING EFFICIENCY any other coal washing table built while maintaining comparable or higher washed coal capacity.

LOSES LESS COAL IN REFUSE than any other machine or process on the market while producing equal or better washed coal product at peak capacity.

YIELDS THE GREATEST PROFIT by its overall efficiency in performance and matchless operating economy.

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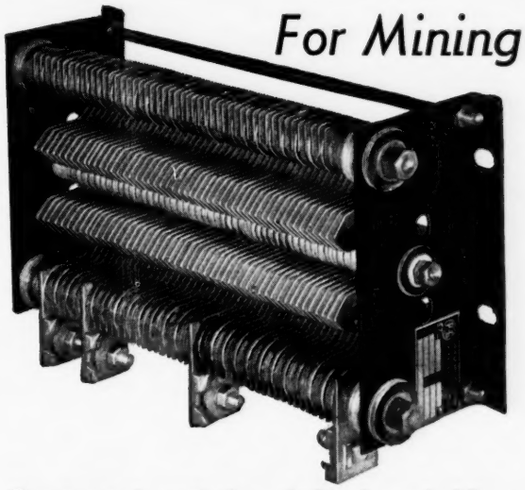
For Mining Machines



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MAGNETIC
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Consider the stomach aches for stokers contained in this pile of junk, shown above, an accumulation of several days, but safely removed from the flow by a Stearns magnet. You owe it to your customers to install the best protection you can buy, STEARNS Magnets! Write for our Bulletin 97-A on Spout Magnets.

Also widely used are STEARNS improved air-cooled powerful Magnetic Pulleys (our Bulletin 301) and Suspended Magnets (Bulletin 25-A). Tell us about your capacities, plant layouts, and other details.

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Underground Methods," A. K. Hert, general superintendent, Snow Hill Coal Corporation. Discussions will follow the presentation of each paper.

•

Federal Mine Inspection Bill Flayed by Battle

The Neely federal mine-inspection bill, now pending in Congress, has nothing whatever to do with safety, according to John D. Battle, executive secretary, National Coal Association. "It is not a safety measure," said Mr. Battle. "It is an effort to build up another bureau, appoint hundreds of snoopers under the guise of inspectors, whose job will be to harass and annoy, hinder and retard the work that is being done now by mining companies and State mining departments."

Speaking at the sixth annual State-wide safety conference held May 7 at Roanoke, Va., on the subject of mine safety and federal coal-mine legislation, the N.C.A. official also said: "The inspection of mines is work for the State departments to do. It's their job and their duty. If any State laws are not adequate to protect life and limb, they should be corrected. Any State department of mines not wide-awake in its efforts to promote safety should be abolished and reorganized in order to do the job necessary to be done. Any coal-producing company not anxious and willing to assist in all practical safety measures has no right to remain in the coal business. Any spokesman for the coal industry who supports or condones unsafe measures, or companies who support unsafe measures are unworthy of your confidence."

•

Birmingham to Have Smoke Chief

Plans to appoint a chief smoke abatement officer to lead a smoke elimination campaign next autumn, in line with recommendations made by a city-wide committee appointed to study the problem, have been announced by the City Commission of Birmingham, Ala. The committee recommended that this officer be a qualified professional engineer with previous experience in the combustion of Alabama coals. In addition the committee suggested a campaign of public education, a school for firemen, and enforcement of the present city ordinance which limits the quantity of smoke pollution in any industrial area. Commissioner of Public Improvements James Morgan will have the campaign in general charge.

•

Awards Prizes in Bar Test

Gibraltar Equipment & Mfg. Co., St. Louis, Mo., awarded two prizes at the American Mining Congress show at Cincinnati to those guessing nearest the ultimate strength of a test bar with an average diameter of 0.495 in., or an area of 0.2 sq.in. A test conducted in the engineering department of Washington University showed that the bar stood an ultimate load of 30,670 lb. Winner of first prize was W. F. Diamond, graduate engineer, power and

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Weighmaster and check weighman alike are enthusiastic over exact Howe Weightographs with convenient double periscopes. Rapid, accurate reading for both individuals. Write today for Folder No. 287, "Fast Exact Weight at a Glance," to The Howe Scale Company, 106 Scale Avenue, Rutland, Vermont.

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TRAMP IRON MAGNETS

● To be located in chutes, shaker screens, ends of loading booms or conveyors for the certain removal of tramp iron and steel during the processing of coal. They safeguard your machinery from damage . . . and assure clean, metal-free fuel for your industrial or domestic customers.

Three poles, energized by a thoroughly insulated coil. Furnished with sufficient tapped holes for quick and easy installation . . . or made to order for unusual applications. For direct current only . . . 110 to 600 volt.

May we send descriptive bulletin and prices? We will also furnish a list of users if desired.

CENTRAL ELECTRIC REPAIR COMPANY
622 GASTON AVE., FAIRMONT, W. VA.

fuel division, Virginia Polytechnic Institute, Blacksburg, Va.; second prize went to W. M. Dishman, president, Jellico Blue Gem Coal Co., Artemus, Ky. The prizes consisted of a 17-jewel Waltham wrist watch and a Gemco Tru Blu multiple leverage punch.

•

Discharge of State Mine Board Asked by Edmundson

A petition asking Governor Horner of Illinois to discharge the entire five-member State Mining Board has been prepared in District 12 headquarters of the United Mine Workers. Ray Edmundson, State U.M.W. president, said a resolution asking that the board be fired for alleged failure to enforce State mining laws was authorized by 145 representatives of Illinois U.M.W. local unions.

Mr. Edmundson appeared before the board on April 29 to charge that violations of the on-shift coal-seam shooting prohibition and mine inspection regulations persisted in mines of the State. The board, which is headed by James J. McSherry, director of the State Department of Mines and Minerals, directed that complaints be submitted in writing.

•

More Time Given for Exceptions To Minimum Prices

Washington, D. C., May 17—Director H. A. Gray of the Bituminous Coal Division, Department of the Interior, granted a ten-day extension, until May 23, to the time for filing exceptions to the examiners' findings on minimum prices on bituminous coal under the Guffey-Vinson act, requests for review, briefs in support of exceptions, and requests for oral argument before the director. Under this arrangement, oral argument is scheduled to begin on May 27. The additional time was granted because a number of district boards, producers and consumer groups had requested extensions.

In his memorandum accompanying the order for extension, the director stated: "A period of twenty days after the mailing of the last portion of the examiners' report is not an unreasonable time for the filing of exceptions, requests for review, and supporting briefs. However, it appears that an additional ten days for the filing of such documents would enable all interested parties further to analyze the record and to limit and clarify the issues involved in their separate contentions, thus contributing toward a more expeditious determination of all the issues raised."

By further order, Director Gray amended the procedural order of July 19, 1939, with an addition stating that the director will not entertain petitions for rehearing or consideration of his final order establishing minimum prices and marketing rules and regulations.

The Senate on May 2 agreed to recommendations of its Appropriations Committee calling for restoration of $1,200,000 in the appropriation for the Bituminous Coal Commission which had been cut from the $2,387,800 called for in the Budget; the allowance for Consumers' Counsel also was

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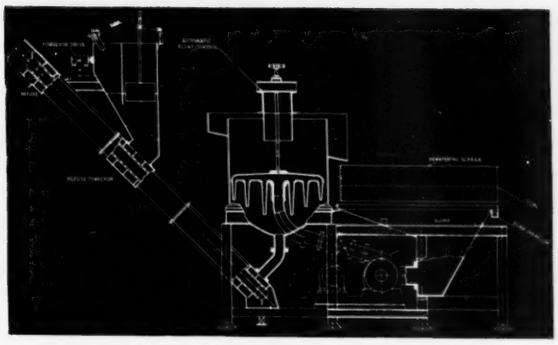

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(Unless Middling Product is Required)

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A GREAT NAME IN THE COAL INDUSTRY
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ONE MAN COAL DRILL

. . . lowers drilling costs because it is designed and constructed to give more power "pound for pound" and more drilling efficiency "day after day." Used successfully in drilling both anthracite and bituminous coal. Easy to operate, easy to handle. Sold with a money-back guarantee. Write today.

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Standardization of Motor Speed

De Laval worm gear driving Jeffrey car-loading conveyor at mine of Kelly Creek Colliery Co.

The use of

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favors standardization of motor speeds and reducing investment in spare motors and parts. It frequently makes possible the selection of high speed motors, with reduction in cost, gain in efficiency, and improvement in power factor.

The ample bearings of De Laval Worm Gears permit of using an overhung pinion or sprocket wheel where chain drive is desirable.

The only maintenance required is an occasional inspection of the oil level.

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TRENTON, N. J.

restored to $151,830, from which the House had cut $12,247. The bill has gone to conference, conferees having been named by both houses.

A ruling by the U. S. Circuit Court of Appeals for the Eighth Circuit, sitting at Kansas City, Mo., that minimum prices at the mine are applicable to the sale of a substantial portion of the coal used by the country's railroads is hailed by Director Gray as another important victory for the coal act. In the case of the Northwestern Improvement Co. vs. Secretary of the Interior Harold L. Ickes the company contended that since the railroad purchasing the coal took possession at the mine mouth, the sale was only intrastate commerce and not subject to minimum prices, even though the railroad transported the coal to another State before using it. The Court decided, however, that the transaction was clearly interstate commerce and subject to regulation under the coal act.

•

Thomas D. Lewis Succumbs

Thomas D. Lewis, 51, general superintendent of mines, Lehigh Navigation Coal Co., died May 11 at his home in Lansford, Pa., after an illness of more than six months.

Thomas D. Lewis

He became associated with the company on his graduation from high school, and held a number of important posts with the organization at various times.

•

Clarence W. Watson Passes

Clarence Wayland Watson, 76, president of the Elk Horn Coal Corporation, died May 24 in Cincinnati following an operation. Born in Fairmont, W. Va., he became interested in coal mining at an early age, organizing several companies which later were merged to form the Consolidation Coal Co. He was president of that company, 1905-11; chairman of the board, 1911-18; and president again, 1919-28. In 1913 he organized the Elk Horn Fuel Co., which was combined with other units to form the Elk Horn Coal Corporation

Clarence W. Watson

in 1915. In 1911 he was elected to the U. S. Senate to fill the unexpired term of Stephen B. Elkins, serving until 1913.

•

Industrial Notes

POMONA PUMP CO., with the establishment of an executive Eastern office at 120 Broadway, New York, has elected C. L. Barrett, formerly general sales manager, to the office of vice-president in charge of sales, and has appointed W. D. Turnbull as general sales manager in charge of the New York office. Prior to joining the Pomona organization, Mr. Turnbull was for seventeen years associated with the Westinghouse Electric & Mfg. Co.

LEE-NORSE CO., Charleroi, Pa., has been organized to design, manufacture and sell all types of modern coal-mining machinery and to conduct extensive engineering activities associated with coal mining. Its major activity will be the promotion and manufacture of underground equipment of the pneumatic-rubber-tired type such as the "Koal-Mobile," and of rubber-tired mountings and carriages for coal cutters, also self-propelled transfer conveyors, electric drills, etc. E. M. Arentzen, Franklin, Pa., and A. L. Lee, Pittsburgh, Pa., are to participate in the management and engineering activities of the company.

YALE & TOWNE MFG. CO. has promoted James C. Morgan from general sales manager of its Philadelphia division to general manager of the entire Quaker City plant. He joined the company in 1920, when he went to Stamford from the C. B. Hunt Co. to take charge of electric truck sales. S. W. Gibb succeeds Mr. Morgan as general sales manager, moving up from assistant sales manager.

MORSE CHAIN CO., Ithaca, N. Y., has opened a new branch office at 1418 Polk St., Houston, Texas. The new branch is managed by Bob Koch, transferred from the home office, where he had been assistant sales manager for the last five years.

ROOTS-CONNERSVILLE BLOWER CORPORATION, Turbine Pump Division, has appointed

these new territorial representatives: Power Machinery Co., Tulsa, Okla., and Kent-Ervin Engineering Co., Minneapolis, Minn., the latter also covering North and South Dakota.

CUTLER-HAMMER, INC., Milwaukee, Wis., manufacturer of electric motor controls, safety switches, service control and allied electrical equipment, has appointed G. E. Hunt to take charge of the company's Indianapolis office. Since joining the company in 1920 he has served at various times in the New York, Philadelphia, Milwaukee and Cleveland sales offices. O. P. Robinson has been transferred to the company's Pittsburgh sales engineering staff. He had been with the Chicago office.

R. G. LETOURNEAU, INC., Peoria, Ill., manufacturer of heavy grading equipment, has promoted Wendell V. Richards, former federal sales supervisor, to federal representative in Washington. He succeeds Stanley P. Means, who has been made manager of the sales training division in Peoria. George W. Lokey, Jr., assistant field engineer, has been named to the post of federal sales supervisor.

NORTHERN EQUIPMENT CO., Erie, Pa., manufacturer of boiler feed controls, has appointed the Meleney Engineering Co., Washington, D. C., as a district representative.

ROLLER-SMITH CO., Bethlehem, Pa., has transferred its switchboard division to a newly acquired plant in Allentown, Pa. J. E. Bevan will be manager with supervision over both engineering and manufacturing. Wilfred A. Clabault has been appointed advertising manager by the company. He was formerly a member of the Westinghouse advertising department.

COMBUSTION ENGINEERING CO., INC., New York City, manufacturer of steam-generating, fuel-burning and related equipment, has elected Joseph V. Santry as president, vice Frederic A. Schaff, made vice chairman of the board. Robert M. Gates, who had been vice president in charge of sales since 1933, resigned to accept the presidency of the Air-Preheater Corporation, New York City. Martens H. Isenberg, who had been vice-president in charge of production, was elected executive vice president to succeed Mr. Santry. Albert C. Weigel, formerly assistant to the president, was elected a vice president.

CATERPILLAR TRACTOR CO., Peoria, Ill., has appointed Howard R. Murphy as sales manager of its central division. He joined the company thirteen years ago, leaving in 1938 to become manager of tractor business for Sears Roebuck & Co.

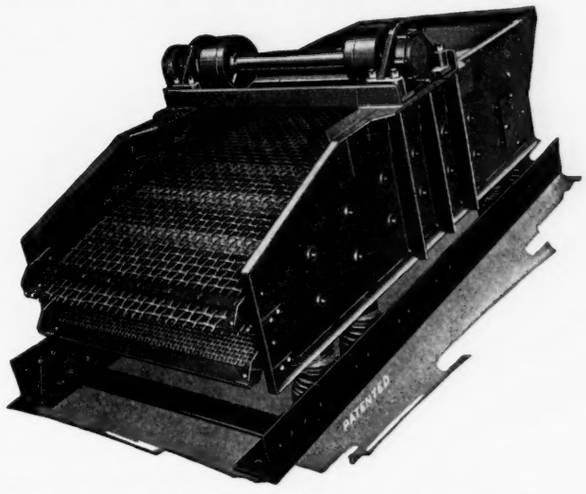
•

Acquires Morea and New Boston

Morea and New Boston collieries, in the Mahanoy City (Pa.) area, operated for some time by the Pasquale Adonizio ("Tony Rose") interests, of Pittston, have passed into other control with the withdrawal of Mr. Rose from the operating picture following a strike called late in May when a number of veteran employees were laid off.

James Carrick, Mahanoy City newspaper

DEISTER PLAT-O VIBRATING SCREEN FOR COAL



1. Powerful high-speed vibrating mechanism.
2. Screen cloth automatically held under uniform tension.
3. Any one screening surface changed without disturbing remaining decks.
4. Cushioned vibration.

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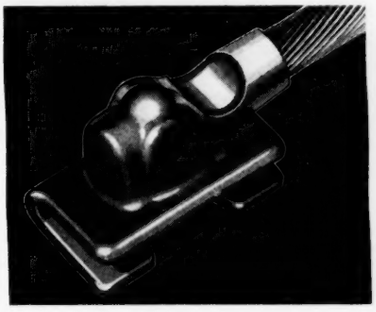
1933 E. Wayne St. Ft. Wayne, Ind.

Canadian Licensee and Manufacturer:
Manitoba Bridge & Iron Works, Ltd., Winnipeg

EXTRA WELDED STRENGTH



in MESCOWELD Rail Bonds

The fact that Mesco Rail Bonds are Flashwelded means they are EXTRA STRONG at the terminals. The Flash-welding process provides welds which are almost entirely oxygen-free, making absolute connections between terminals and each individual strand in the cable. It pays off in greater strength at the terminals and lower resistance.

Mosebach Flashwelded Rail Bonds are made in seven styles, for every bonding requirement. A complete installation will save you money in welding, power and replacement costs.

Write today for descriptive literature.

MOSEBACH
ELECTRIC & SUPPLY COMPANY
1115 Arlington Avenue Pittsburgh, Pa.

DIAMOND CORE DRILLING

CONTRACTORS

Testing Coal Properties A Specialty

up to 1500' cap. 2¼" core

Guaranteeing Proper & Satisfactory Coal Cores. Large Dia. Holes drilled inside mines for all purposes.

MOTT CORE DRILLING CO.
Huntington, W. Va.

man, is president of the new group, incorporated as the Morea-New Boston Breaker Corporation. Output of the two mines is to be prepared in a new breaker constructed with funds raised by local interests.

•

Start Work on New Shearn Tipple

Construction of a new tipple was begun early in May at the Belcano mine of the Shearn Coal Co., Belton, Ky. The new plant, which is expected to be completed early in July, will replace a similar structure destroyed by fire on April 13, resulting in a loss of about $18,000.

•

Labor Board Decision Stands

The United States Supreme Court refused on May 6 to review a National Labor Relations Board decision ordering the Good Coal Co., Lisle, Ky., to reinstate 107 employees allegedly dismissed for union activity and to bargain collectively with the United Mine Workers, District 19. The company had appealed from a ruling by the Sixth Federal Circuit Court which upheld an order of the labor board.

The board order also required the company to disestablish and cease alleged domination of the Wallins Creek Employees' Association. On the ground that the company was engaged only in intrastate commerce, it contended that the labor board was without jurisdiction.

•

To Strip at Kehley Run

Pasquale Adonizio, Pittston (Pa.) operator, planned to resume operations at the Kehley Run colliery, Shenandoah, Pa., about the middle of May. It was his intention, he announced, to reopen the upper levels and start stripping. The coal is to be prepared at the William Penn breaker of the William Penn Colliery Co.

•

Illinois to Construct Plant For Briquet Experiments

A $78,140 contract for construction on the campus of the University of Illinois, Urbana, Ill., of a laboratory to complete experiments in the development of smokeless briquets from Illinois coal has been signed by the State. Charles P. Casey, Director of Public Works and Buildings, explained that the new building will be used both for research and commercial demonstration of the briquetting process.

Attempts to find a commercially feasible process for treating Illinois coal have been speeded as a result of the new St. Louis ordinance restricting the use of smoky coal. The State university experiments are being financed by a legislative appropriation cut from an original $300,000 to $180,000 by Governor Horner's partial veto.

•

U.M.W. Wins at Hart Plants

The National Labor Relations Board has certified the United Mine Workers as bargaining agency for employees of the Hart Coal Corporation, operating in Hopkins County, Kentucky. The Board denied a request by the company and the Progressive Mine Workers that an election held to decide the issue be set aside.

•

Fox Run Mine Suspends

After operating for 36 years, the Fox Run mine of the West Kentucky Coal Co., near Madisonville, Ky., has suspended permanently, it was announced on May 8. The coal had been exhausted, company officials said. Machinery and steel are being removed from the mine and 200 miners were thrown out of employment.

•

N. C. Moore Is Dead

N. C. MOORE, president, Pacific Coast Coal Co., Seattle, Wash., died during the third week of May.

•

Trade Literature

BEARINGS—Fafnir Bearing Co., New Britain, Conn. Catalog 35X, a condensed edition of the company's large catalog, gives full data on dimensions, load ratings, types and sizes of Fafnir bearings, covering the complete line of radial, thrust, precision, self-aligning and sealed bearings and housed transmission units. More than 55 distinct types, embracing over 100 series, are cataloged in the 130 odd pages of tables, diagrams and illustrations.

BLOWERS—Jeffrey Mfg. Co., Columbus, Ohio. Bulletin 739 points out features and advantages of blowers and exhausters for

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Mining Engineers and Geologists
Examinations and Reports
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coal and metal mines, giving dimensions, capacities, etc.

COAL PREPARATION—Koppers-Rheolaveur Co., Pittsburgh, Pa. Form E-6 describes Koppers Menzies cone separator. Form E-7616 covers Koppers-Rheolaveur coarse-coal preparation equipment for improving quality and uniformity. Form E-7617 is devoted to equipment for fine coal.

COAL PREPARATION—McNally-Pittsburg Mfg. Corporation, Pittsburg, Kan. Bulletin 440 pictures and describes the company's rotary dumps, citing seven advantages. Bulletin 540 gives data on coal crushers, with capacities and dimensions. Catalog 637 contains a complete listing of the company's extensive line of preparation equipment.

COMBUSTION CONTROL—Republic Flow Meters Co., Chicago. Data book S-21 discusses basic problems in efficient operation of modern boilers and shows how the Republic-Smoot combustion-control system solves them.

CONDENSER—Ingersoll-Rand Co., Phillipsburg, N. J. Bulletin Form 2622 describes the cross-flow Type R surface condenser designed for high vacuums and high efficiency in small capacities; sizes range from 200 to 1,500 kw. Typical installations with cross-sectional views and structural details are shown.

CONVEYOR EQUIPMENT—Goodman Mfg. Co., Chicago. Bulletin CM-391 describes the company's complete line for conveyor mining, including shaker drives, duckbills, shaker accessories, conveyor shortwalls, troughed belt conveyors, flat belt conveyors, chain conveyors and elevating conveyors.

CONVEYOR EQUIPMENT—Jeffrey Mfg. Co., Columbus, Ohio. Catalog 740 gives detailed information on equipment designed especially for conveyor mining, including conveyors, loaders, cutters, drills and blowers.

CONVEYOR SYSTEMS—Barber-Greene Co., Aurora, Ill. Bulletin 676 covers both surface ground storage and underground handling of coal. Stressed throughout is the use of standardized units, engineered and assembled at the factory to provide built-in accuracy and low cost, and adaptable to the many conditions encountered. Illustrations of typical installations are shown.

CONVEYOR LOADER—Jeffrey Mfg. Co., Columbus, Ohio. Bulletin 741 covers features, advantages and specifications of the Type 61CL unit, especially designed for conveyor mining.

ELECTRICAL EQUIPMENT—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Descriptive Data 49-120 covers Type FP dust-tight capacitors for use in industrial plants coming under the scope of N.E.C. regulations for hazardous locations. Application Data 49-060 deals with the application of capacitors for power-factor correction.

EXCAVATOR CONTROL—Harnischfeger Corporation, Milwaukee, Wis. Bulletin X-60 describes a new system the company is installing on its ⅜-, ½- and ¾-yd. excavators, a specialization of a system which has proved successful in the automotive industry but has never been used in excavators.

GEARMOTORS—Reliance Electric & Engineering Co. Bulletin 403 tells about Type S single-reduction units. Bulletin 404 describes double- and triple-reduction units.

HARD-FACING RODS—Dymonhard Corporation of America, New York City. Booklet entitled "Wear" gives hard facts on hard facings with special emphasis on the high hardness, toughness, and resistance to wear, shock, heat and corrosion of Dymonhard facings.

LOCOMOTIVE BRAKE—Jeffrey Mfg. Co., Columbus, Ohio. Folder 742 cites salient features and advantages of its hydraulic braking system.

MAGNETIC STARTERS—Trumbull Electric Mfg. Co., Plainville, Conn. Circular 322 explains in detail and illustrates the exclusive features of its entire line of across-the-line units.

MINING ROPE—Macwhyte Co., Kenosha, Wis. Leaflet describes types of wire rope for coal mining, giving specifications.

PAINTS—Skybryte Co., Cleveland, Ohio. Catalog VIII features paints and other new and unusual maintenance materials.

PNEUMATIC COAL CLEANING—Link-Belt Co., Chicago. Folder 1821 relates to the Link-Belt-American system, which dedusts and drys as it cleans. "Y" type double-deck and "Twin-Dex" type tandem-deck pneumatic separators are illustrated.

ROCK-DRILL ACCESSORIES—Ingersoll-Rand Co., Phillipsburg, N. J. Booklet Form 2410 illustrates and furnishes data on the many accessories necessary to efficient rock drilling. These include: hose and couplings, air filters, grinders, steel cutters, air-line lubricators and rock-drill mountings; moil points, chisels and spades for breaking concrete; tamping and digging.

SCREEN—Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin B-6088 illustrates and describes the Sta-Kleen low-head horizontal screen with "ball deck" that gives a secondary vibration to prevent blinding, and points out the operating advantages of this arrangement. Case histories are included of successful installations in the screening of damp slack and other moist material.

STEEL VALVES—Manning, Maxwell & Moore, Bridgeport, Conn. Bulletin 5-7000, covering Hancock steel valves, contains complete dimensions of all types of valves, with complete material specifications of all metals used in them; also reproduces in full the A.S.M.E. service rating tables.

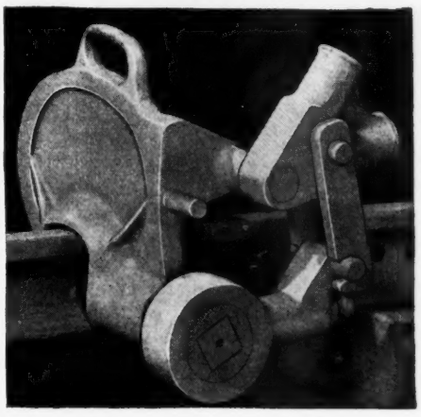
STOKERS—Link-Belt Co., Chicago. Catalog 1782 dwells on the method and advantages of stoker firing, particularly stressing the Link-Belt "Magic Flame" combustion principle. It covers the company's line of domestic bituminous stokers, both hopper type and bin fed; anthracite models, hopper and bin-fed types, with or without ash removal; and commercial and industrial bituminous stokers for boilers up to 300 h.p.

STORAGE BATTERIES—Gould Storage Battery Corporation, Depew, N. Y. Bulletin 200 describes characteristics and advantages of Kanthanode Glassklad batteries for mine locomotives and rubber-tired haulage, giving rated capacities and technical data.

SWITCH AND BUS INSULATORS—Ohio Brass Co., Mansfield, Ohio. Bulletin 696-H tells how to judge station posts, describes design features, presents useful handbook data,

GEMCO TRU-BLU TOOLS

THE HIT OF THE SHOW!



Multiple Leverage-Ratchet Punch gives 3-1 efficiency or saves over half the effort required with any other punch on the market.

GEMCO TRU-BLU TOOLS GIVE SAVINGS WITH SAFETY!

Tools for All Rail From 8-120 lbs.

Gemco Tru-Blu tools will save up to 50% of the cost over old methods on all rail from 8 to 120 lb. sizes! Write us for proof of how you can cut your production cost by using all items in the "Gibraltar" line of mining tools: Standard and Ratchet type Rail Punches and Rail Benders; Spike Bars; Mine Cars for Track Layers, Drillers, Shot Firers, Supplies, Trouble Shooting, and "Hot Shot" Inspection Trips; Car Stops; Rerailers; Derailers; Mine Ambulances; Keyseating Machines; Grease Guns; Mine Car Wheels, (Pressed or Cast, Steel or Iron), Combination Track Tools, etc.

"Gemloy Steel" Contest Winners

FIRST

MR. W. F. DIAMOND, Blacksburg, Va., c/o Department of Power & Fuel, Virginia Polytechnic Institute.

SECOND

MR. W. M. DISHMAN, Artemus, Ky., President, Jellico Blue Gem Coal Co.

To the other 2,027 contestants—Thanks a lot for trying! If you didn't win a new multiple leverage-ratchet punch we will be happy to send you one on a 30 day free trial basis. Just give us shipping instructions.

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Cool Caps and Hats Electric Cap Lamps Safety Lamps
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There are many plus-profit features incorporated in the design and construction of the Simplicity Screens. This is one of the reasons why our users report six, eight and even ten years of service without any major maintenance expense. Every installation of Simplicity Gyrating Screens is guaranteed as to results.

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and gives complete catalog information on O.B.'s conventional insulators of the pin and cap type and those of the post type. A feature is a panorama of all unit-type insulators, followed by detailed information on individual units, an arrangement that simplifies selection procedure.

TRUCKS—Marmon-Herrington Co., Inc., Indianapolis, Ind. Bulletin 400307 describes new models of M-H heavy-duty all-wheel-drive trucks, containing miscellaneous illustrations, general description, detailed specifications and a summary of important features.

TWO-STAGE PUMPS—Fairbanks, Morse & Co., Chicago. Bulletin 5972 gives applications, salient features and principal dimensions of the company's line of two-stage split-case pumps with capacities up to 550 g.p.m. at heads ranging up to 600 ft. t.d.h.

V-BELTS—Allis-Chalmers Mfg. Co., Milwaukee, Wis. Catalog 151 introduces new horsepower ratings for multiple V-belt drives based on the new formula developed by Robert F. Vogt and recently adopted by the industry. Engineering information is provided on selection of size of belt for horsepower rating, speed, center distances and sheave diameters.

VIBRATING SCREENS—Nordberg Mfg. Co., Milwaukee, Wis. Bulletin 96 shows by word and picture the salient features of Symons screens, giving sizes and dimensions.

WELDING AID—General Electric Co., Schenectady, N. Y. Bulletin GEA-3198A tells the advantages of G-E glyptal No. 1294 in preventing adhesion of weld spatter.

WIRE ROPE—Broderick & Bascom Rope Co., St. Louis, Mo. Leaflet shows "Flex-Set" preformed yellow-strand special LeTourneau rope at work in a variety of exacting services.

WIRE-ROPE CLIP—Thomas Laughlin Co., Portland, Me. Bulletin describes features of the Laughlin "Safety" clip, showing results of competitive tests.

WIRES AND CABLES—Simplex Wire & Cable Co., Cambridge, Mass. Simplex Manual (1940 edition) gives description, properties, uses and engineering data on wires and cables for various purposes.

WIRING TOOLS—Ideal Commutator Dresser Co., Sycamore, Ill. Folders describe and picture wire strippers and cutters, "Wire-Nuts" for making wire joints, etc.

•

Coal-Mine Accident Fatality Rate Advances Sharply

Accidents at coal mines of the United States caused the deaths of 137 bituminous and 14 anthracite miners in March last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 35,400,000 tons, the accident death rate among bituminous miners was 3.87 per million tons, compared with 2.09 in the corresponding month of last year.

The anthracite fatality rate in March was 3.71, based on an output of 3,773,000 tons, against 3.61 in March, 1939.

For the two industries combined, the accident fatality rate in March last was 3.85, compared with 2.23 for the third month a year previous.

Fatalities during March last, by causes and States, as well as comparable rates for the first three months of 1939 and 1940, are shown below:

UNITED STATES COAL-MINE FATALITIES IN MARCH, 1940, BY CAUSES AND STATES

	Underground									Opencut and Surface				
State	Falls of Roof	Falls of Face	Haulage	Gas or Dust Explosions	Explosives	Electricity	Machinery	Other Causes	Total Underground	Railway Cars	Electricity	Other Causes	Total Surface	Grand Total
Alabama	1	1	..	..	..	..	1	..	3	..	..	..	..	3
Illinois	1	..	1	..	..	..	..	1	3	..	..	..	..	3
Indiana	2	..	..	..	..	1	..	..	3	..	..	..	..	4
Iowa	..	..	2	..	..	..	..	..	2	..	..	..	..	2
Kansas	..	..	..	..	..	..	..	..	..	..	..	1	1	1
Kentucky	8	..	2	..	..	..	..	..	10	..	..	..	..	10
Ohio	2	..	..	72	..	..	..	..	74	..	..	1	1	75
Pennsylvania (bit.)	7	..	3	..	1	..	1	..	12	..	..	..	..	12
Tennessee	..	..	1	1	..	..	..	..	2	..	..	..	..	2
Virginia	2	1	..	1	..	..	..	..	4	..	..	..	..	4
West Virginia	8	3	6	..	..	..	..	..	17	1	..	2	3	20
Wyoming	..	..	..	..	..	..	..	1	1	..	..	..	..	1
Total (bituminous)	31	5	15	74	1	1	2	2	131	1	..	4	5	137
Pennsylvania (anthracite)	6	..	3	1	1	1	..	1	13	..	1	..	1	14
Grand total	37	5	18	75	2	2	2	3	144	1	1	4	6	151

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

January–March, 1939 and 1940

	Bituminous				Anthracite				Total			
	Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons	
Cause	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940
Underground:												
Falls of roof and coal	126	134	1.196	1.122	36	23	2.841	1.777	162	157	1.373	1.186
Haulage	40	51	.380	.427	3	15	.237	1.159	43	66	.364	.499
Gas or dust explosions:												
Local	2	1	.019	.008	....	1	.....	.077	2	2	.017	.015
Major	....	167	.....	1.398	....	...	.....	.....	....	167	.....	1.261
Explosives	4	7	.038	.059	8	2	.631	.155	12	9	.102	.068
Electricity	13	6	.123	.050	1	1	.079	.077	14	7	.118	.053
Machinery	6	9	.057	.076	....	...	.....	.....	6	9	.051	.068
Shaft	2	1	.019	.008	2	...	.158	.....	4	1	.034	.007
Miscellaneous	4	8	.038	.067	4	1	.316	.077	8	9	.068	.068
Stripping or opencut	2	4	.019	.033	1	2	.079	.155	3	6	.025	.045
Surface	8	11	.076	.092	4	3	.316	.232	12	14	.102	.106
Grand total	207	399	1.965	3.340	59	48	4.657	3.709	266	447	2.254	3.376

* All figures subject to revision.